SMART CITIES OPEN DATA GUIDE

Advice, best practices and tools for creating a data-driven city

SmartCitiesCouncil

LIVABILITY | WORKABILITY | SUSTAINABILITY

FOREWORD

Citizens today are demanding more accountability from their government. They want to see how their tax dollars are spent. They want to put a stop to waste and bloated bureaucracies. And they want their civil servants to be like the clerk at the convenience store around the corner – ready to serve them what they need, when they need it. Or better yet, they'd like to access those services from the comfort of home or work via the web or on the go with their mobile devices.

With open data all of that – and more – is possible.

Open data is about transparency, about giving citizens access to the data their tax dollars help create and it's about innovation – enabling software developers to transform that data into useful applications that make city services available anytime, anywhere.

If you are looking for a low-cost, high-return way to begin a smart city journey, open data provides it. There are challenges, certainly – privacy concerns, data formatting issues and resource constraints common among them. But this eBook developed by the Smart Cities Council® is loaded with expert advice, step-by-step guidance, useful resources and best practices from data-driven cities to help you overcome them.

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CHAPTER 1

OPEN DATA: THE MOTHER LODE JUST WAITING TO BE MINED

What's the biggest challenge for city leaders who want to leverage open data to improve their communities and the lives of their citizens? It may be figuring out where to start. That's because the possibilities are virtually unlimited.

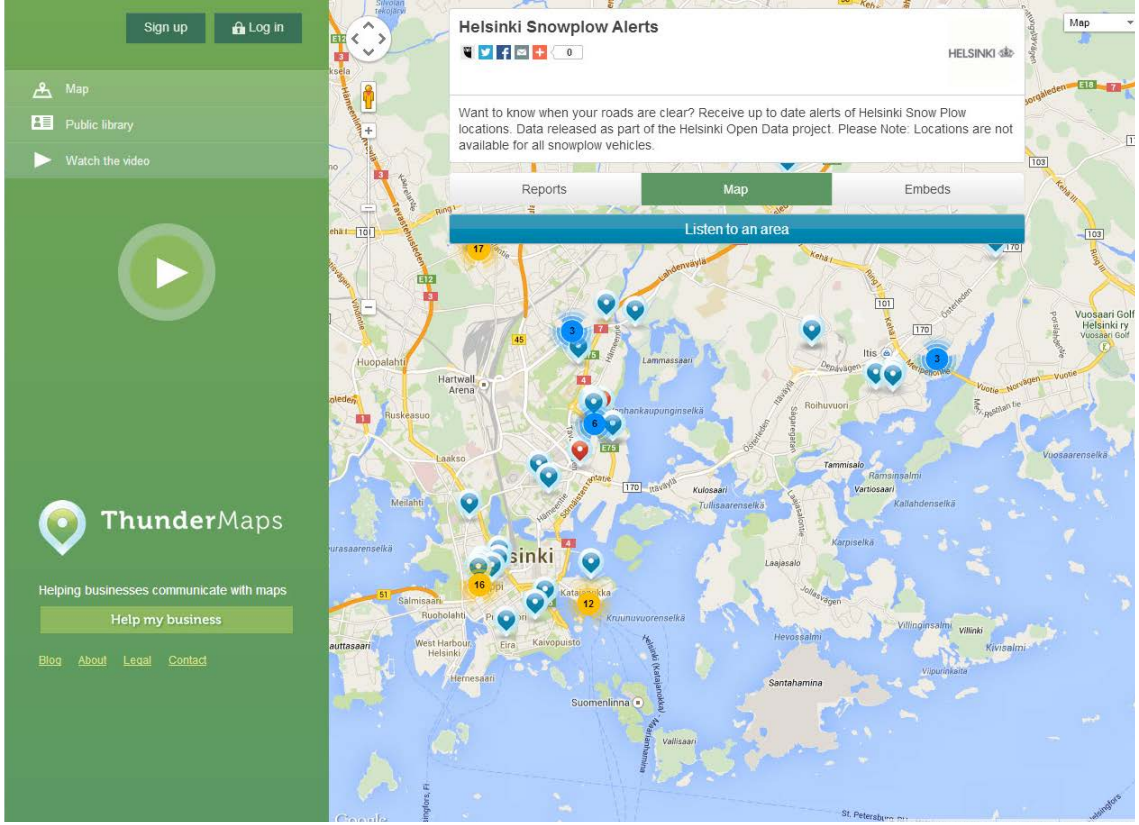
Let's begin with a quick look at some common problems that plague cities everywhere – and how savvy developers have tapped into government data sets to address them:

Dangerous dogs: Residents in Austin, Texas, can check an online map to find out where dogs that the courts have declared dangerous and ordered restrained due to past attacks live. The information pulled from court records pinpoints the address, even the dog's name and description.

Road construction: Some joke that Edmonton, Alberta, has two seasons: winter and road construction. Given the hardship that construction zones pose for businesses in the area, as well as residents trying to get to work or pick up kids, one of Edmonton's notable open data initiatives involved street construction data. And using that data, a local developer created a free mobile app people can use to – among other things – see which streets to avoid and when.

Safe neighborhoods: By combining crime data with housing information, civic hackers in Philadelphia created an online tool that displays both available housing and criminal activity in the vicinity. The RentSafe app is intended for people who want to know if a place they may want to rent or buy is in a safe location.

Getting around: The transit agency serving the city of Paris opened up its data to



Where's the snow plow?

As part of its multi-city Helsinki Region Infoshare open data project, more than 1,000 data sets have been released, including the real-time location of snow plows. As a result, residents can look at a map online to see where they are.

encourage developers and entrepreneurs to make commuting easier for the 10 million people who use its networks on a daily basis. One of many results was the Metro Paris Subway app that gives users alerts in real time when a disrupted line is detected. It also maps metro stations and helps users automatically find the best route to get to their destination.

And of course there are many, many more ways cities and the developer community are creating value from data. You'll find additional examples and case studies in the next chapter. But first, let's look at what we mean by open data and why it has become such a focal point in the transition to smarter cities.

Open data plain and simple

Cities and other public entities, by their nature, collect all manner of information on just about anything and everything that happens within their purview – tax payments, marriage licenses, food safety inspections, bus ridership, crime reports, court records, library cards, pet licenses, abandoned properties, disease outbreaks, new businesses, energy and water consumption, building permits and on and on.

Most of this information has been collected over the years at taxpayer expense, and at least some of it has been available for public review. But getting at it efficiently was a challenge in the days of paper-based record-keeping. The PC era introduced electronic record-keeping, which in turn introduced a plethora of "data sets." A data set is a collection of separate but related data elements – for example, the court records involving dangerous dogs mentioned earlier would be a data set. By unlocking these data sets and posting them online, they can be easily accessed, analyzed, manipulated and shared.

So all of that data cities routinely collect is like the Mother Lode just waiting to be mined.

Unlocking data

By unlocking these data sets and posting them online, they can be easily accessed, analyzed, manipulated and shared.

BIG DATA VS. OPEN DATA

It's hard to escape the terms big data and open data these days. And though they are certainly related, they are not the same.

"While big data is defined by its size, open data is defined by its use," notes Joel Gurin in a piece for the Public Leaders Network.

Big data refers to the ongoing accumulation of massive, often complex and always-changing data sets – for instance, machine-generated data from sensors or cell phone GPS signals. Or it may be data from social media sites. Big data's value is that it can be analyzed and manipulated to provide insights and promote better decision-making.

And while big data can become open data, it is not by definition available to the public.

Open data, on the other hand, are data sets purposely made available to the public to use and reuse. Those sets may come from big data but they don't have to. Smaller amounts of data can be useful too.

As an example, consider the food-safety inspections conducted in restaurants, bars, bakeries and the like. New York City's health department performs unannounced inspections of all 24,000 restaurants in the city at least once a year. To protect diners from food-borne illnesses, inspectors check for compliance in food handling, food temperature, personal hygiene and vermin control. When they complete an inspection, they total up the number of points on their checklist and give the restaurant a score.

For anyone who frequently dines out in New York City, that's pretty useful information. No one wants to knowingly frequent a place with hygiene issues or vermin problems.

And city officials in New York get that. The restaurant inspection scores represent a data set and are in fact just one of hundreds of data sets that city officials have "opened," meaning they have posted the data online in a usable format that anyone and everyone can access.

So the act of opening data is like extending an invitation to prospectors – software developers, entrepreneurs, journalists and anyone else for that matter – to freely take the data and turn it into something useful, innovative or profitable (or all three).

But New York City doesn't leave that to chance. The city's Department of Health and Mental Hygiene offers both an online search tool people can use to find restaurant

inspection results as well as a free mobile app (shown here) that enables users to check inspection letter grades at restaurants near their current location, or search by restaurant name or neighborhood. And the information is updated daily.

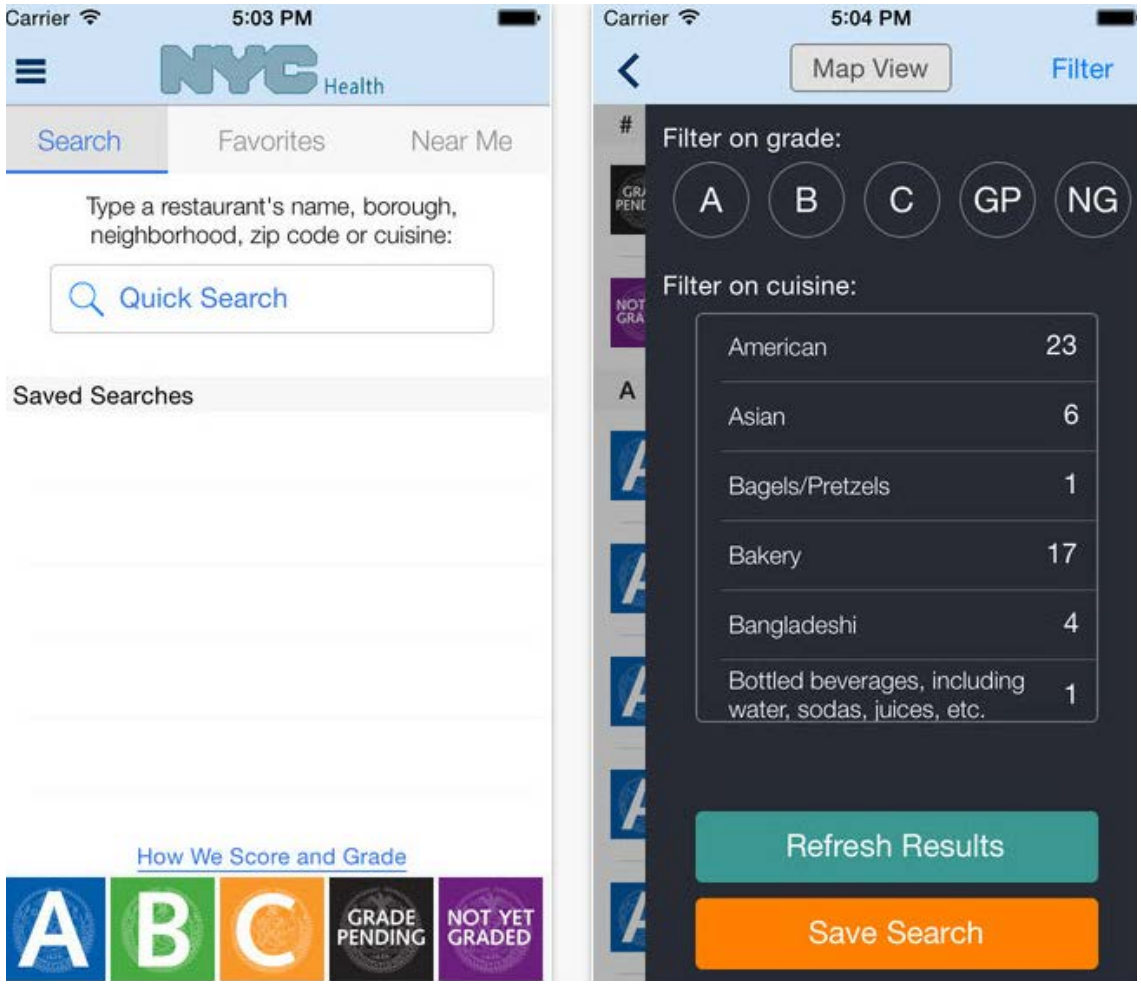
As you can see, open data represents a powerful opportunity for cities to connect with citizens in meaningful and life-impacting ways.

But what has to happen for data to be deemed open? The World Bank offers a straightforward definition. It considers data open if it satisfies these two conditions:

Technically open: It is available in a machine-readable standard format, which means it can be retrieved and meaningfully processed by a computer application.

Legally open: It is explicitly licensed in a way that permits commercial and non-commercial use and reuse without restrictions.

Later in this eBook, we'll explore the technical and governance challenges as well as the privacy and security issues inherent in that definition. For now, let's look at how this whole open data movement started.



Checking a restaurant

New York city offers a free mobile app that enables users to check inspection grades at restaurants near their current location, or search by restaurant name or neighborhood. The information is updated daily.

The "open" movement evolves

The open data concept is not necessarily new. The scientific community was likely the first to acknowledge the value of sharing research data openly. But in its brief look at the history of open data, the Paris Tech Review notes, "It is the encounter between this scientific idea and the ideals of free software and open source that shaped open data as we know it today."

Efforts to promote a more open and transparent government also are not a recent occurrence. In 1967, the Freedom of Information Act took effect in the United States, providing that any person has a right, enforceable in court, to obtain access to federal agency records – except those protected from public disclosure by one of nine specific exemptions and three law enforcement records exclusions. The advent of open meeting and "sunshine" laws also set a tone for more open government.

And some credit Washington, D.C. with pioneering the first open data edict in the U.S. back in 2006.

Yet it may have been a meeting in Sebastopol, California, in 2007 that gave the open public data movement some structure.

The gathering of 30 well-known Internet activists and open source advocates was intended to define the open public data concept and have it adopted by U.S. candidates running for president in 2008. In a statement of purpose, the group suggested:

"The Internet is the public space of the modern world, and through it governments now have the opportunity to better understand the needs of their citizens and citizens may participate more fully in their government. Information becomes more valuable as it is shared, less valuable as it is hoarded. Open data promotes increased civil discourse, improved public welfare, and a more efficient use of public resources."

The group also developed a set of eight principles for open government data:

1. **Complete**: All public data is made available. Public data is data that is not subject to valid privacy, security or privilege limitations.
2. **Primary**: Data is as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.
3. **Timely**: Data is made available as quickly as necessary to preserve the value of the data.
4. **Accessible**: Data is available to the widest range of users for the widest range of purposes.
5. **Machine processable**: Data is reasonably structured to allow automated processing.
6. **Non-discriminatory**: Data is available to anyone, with no requirement of registration.

An open data proponent

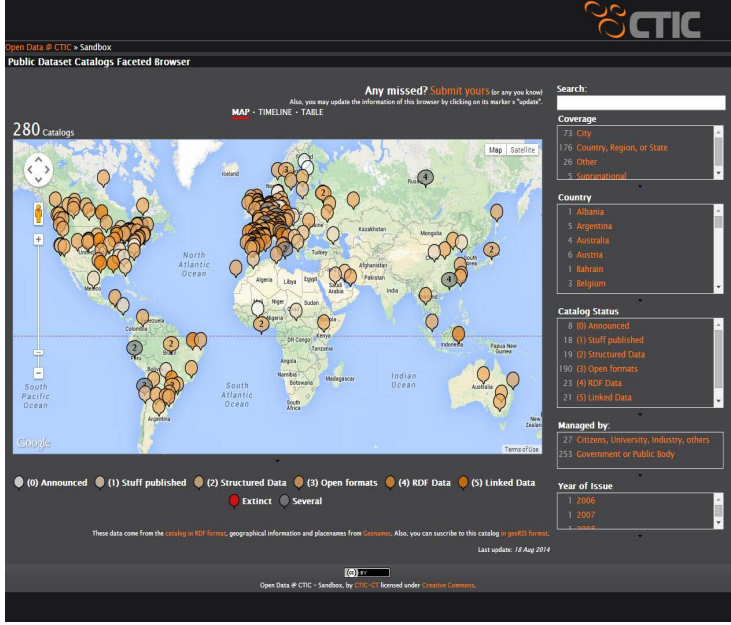
Weeks after he took office in January 2009 , U.S. President Barack Obama issued his first executive act – a Memorandum on Transparency and Open Government.

London's Datastore

Mayor Boris Johnson announced in January 2010 his intent to make London the first open data city in Britain and launched the London Datastore.

Open data catalogs

Though some regions have been slower than others to embrace open data, the CTIC identified 280 open data catalogs globally as of August, 2014.



7. **Non-proprietary**: Data is available in a format over which no entity has exclusive control.

8. **License-free**: Data is not subject to any copyright, patent, trademark or trade secret regulation. Reasonable privacy, security and privilege restrictions may be allowed.

And this group had a believer in Barack Obama. Weeks after he took office in January 2009 as the 44th U.S. President, he issued his first executive act – a Memorandum on Transparency and Open Government. Among the major points: *Requiring federal agencies to make a minimum of three "high-value" data sets available within 45 days.* President Obama continues to push the open agenda in his second term. One example: In May 2013, he issued an executive order making open and machine readable the new default for government information.

And cities are following suit. Months after Obama's open by default directive, the Sunlight Foundation, a nonprofit that pushes for greater government openness and transparency, announced the city of Louisville, Kentucky, as the first in the U.S. to declare open data the "default" for the formatting, storage and availability of its electronic information. And the following year, San Francisco was touted as the first American city to pass an open data law. Again, others have followed suit. Today the US City Open Data Census uses 18 categories of data sets to help cities assess their open data progress. Categories range from asset disclosure to crime to transit.

An "almighty gift" to developers

London has been a leader in Europe's open data movement. Mayor Boris Johnson announced in January 2010 his intent to make London the first open data city in Britain and launched the London Datastore. Data sets released in the first wave included crime rates, planning decisions, traffic accidents and house prices, among many others. As Martin Bryant wrote at the time on thenextweb.com, "This is an almighty gift to developers who have long bemoaned the way data about public life is kept under lock and key."

The London Datastore is continually updated as new data sets are released. The portal includes links to inspirational ways develop-

DIFFERENT KINDS OF DATA

Most democratic nations' "National Spatial Data Infrastructures" provide open access to many "layers" of geospatial data: elevation, land cover, land use, transportation, political and jurisdiction boundaries, water bodies, etc. Non-spatial data of many kinds is also available online: economic data, demographic data and public health information.

Why?

Open access to data is a right of the citizens who have paid for it; it is an economic driver; an informed public is a stronger public; and governments at all levels need to share data across jurisdictions. Also, the cost of developing and maintaining data goes down when "create once, use many" is the rule.

Open data becomes even more powerful when different data sets are combined. For example, weather data when combined with additional data like transportation and social/sentiment analysis can provide a big impact on public safety during major events like the World Cup, natural disasters and the like.

ers have used the data and has a comments section where people can log suggestions for tools they'd like to see developed with the data sets.

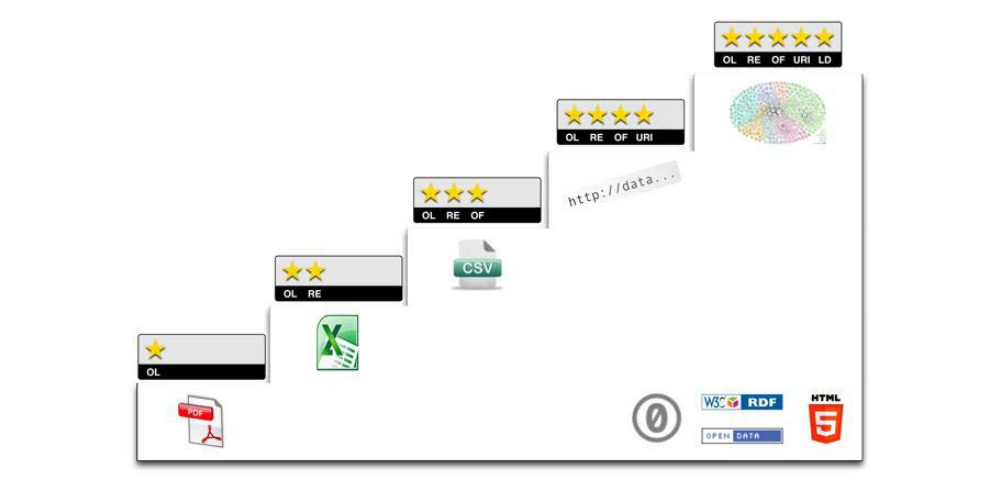
While cities in the U.S. and Europe had some early success with open data, others are just getting started. In China, for example, the Open Data China website was launched in early 2014 by a newly formed Open Data Community that intends to advocate for open data, cultivate data skills and support open innovation. A report on WeGov indicates that city governments in China started releasing data sets in the 2012 timeframe, Shanghai and Beijing among them. But it describes the movement as "fledgling."

Still, there has been significant progress globally in recent years. CTIC (which leads the W3C eGoverment initiative) had identified 280 open data catalogs around the world (roughly a quarter of them come from cities) by August, 2014.

How open data benefits cities and their economies

By now you've seen numerous examples of how government data is being transformed into useful tools to improve citizens' lives. But the benefits extend well beyond the tools. Data is a valuable and potentially profitable

5 STAR OPEN DATA



Tim Berners-Lee, perhaps best known as the inventor of the World Wide Web, developed a 5 star deployment framework for open data that includes costs and benefits associated with each level.

- * Data available with open license but not machine readable (e.g. zip, pdfs)
- ** Data available and machine readable in proprietary formats (e.g. Excel)
- *** Data available and machine readable in non-proprietary formats (e.g. xml, csv, etc)
- **** Data available using open linked formats
- ***** Data available and linked with other relevant data

resource that can fuel innovation and invention, thereby creating new businesses, revenue streams and jobs.

A 2013 McKinsey report suggested seven sectors alone could unlock $3 trillion to $5 trillion a year in additional value as a result of open data, noting it is "already giving rise to hundreds of entrepreneurial businesses and helping established companies to segment markets, define new products and services, and improve the efficiency and effectiveness of operations." The sectors McKinsey identified, in order of revenue potential, are:

- Education
- Transportation
- Consumer products
- Electricity
- Oil and gas
- Healthcare
- Consumer finance

More specifically, McKinsey suggests that open data:

Has a large potential economic value from its benefits, including increased efficiency, new products and services, and a consumer surplus (cost savings, convenience, better products).

Enhances big data's impact by creating transparency, exposing variability, and enabling experimentation; helping companies to segment populations and thus to

customize actions directed at them; replacing or supporting human decision making; and spurring innovative business models, products, and services.

Creates multiple business opportunities such as the potential to raise productivity, to improve new products and services, and to enable entirely novel lines of business for both established companies and entrants.

Benefits consumers even more than businesses by creating price and product transparency as well as new channels to provide feedback that improves the quality of goods and services (including public ones).

Open data can be an economic boon for the private sector – but the same is true for the public sector.

Neelie Kroes, vice president of the European Commission and a strong advocate of open data, wrote in late 2011 that public-sector information generates more than 30 billion euros per year in economic activity. "By opening up this resource fully," she said, "we could more than double the value of this activity – to around €70 billion."

Open data as an economic boon

Cities that open their data are seeing new entrepreneurial businesses emerge, creating more jobs and boosting tax revenues from the increased economic activity.

Indeed, there are several scenarios where opening data provides economic value:

- Cities that open their data are seeing new entrepreneurial businesses emerge, creating more jobs and boosting tax revenues from the increased economic activity.
- Cities that promote an innovation economy exude a "cool factor" that attracts businesses and young, skilled workers.
- Cities with highly sought-after data sets can create revenue by charging for commercial use of the data while maintaining free access for citizens.

Open data can also be a powerful force for social good at every level of government. In 2013, for example, Microsoft co-founder Bill Gates worked with Obama Administration officials to promote open access to agricultural data as a way to improve global nutrition and food security.

CHICAGO'S ARRAY OF THINGS

Another twist on crowd-sourcing and citizen reporting is using sensors for gathering vast amounts of data. The "Array of Things" project in Chicago is a case in point.

Data-collection sensors on light poles will measure air quality, sound volume, precipitation and the like. The sensors will also count people, according to a Chicago Tribune report, by measuring wireless signals from mobile phones.

The idea is to gather and publish a broad array of data that will help researchers understand the city better and give them tools to create a safer, cleaner and more efficient Chicago. But the project is on privacy advocates' radar. Some worry the sensors will gather too much personal information from passers-by and their mobile phones.

"We don't collect things that can identify people," Charlie Catlett told the Tribune. "There are no cameras or recording devices." Catlett, director of the Urban Center for Computation and Data, said sensors will collect sound levels but not record actual sound and that imaging will be infrared not video.

Council members Cisco, Qualcomm and Schneider Electric are among the companies lending engineering expertise to the Chicago project.

Open data boosts city efficiency

A whole slew of crowd-sourcing applications have emerged as a result of cities opening up their data, creating legions of "citizen reporters" who use smartphone or web apps to identify maintenance issues or provide useful information to city planners.

Here are a few examples:

King-miCity: Residents of King Township in Ontario, Canada can use the King-miCity app developed by Council member Imex Systems to, among other things, submit service requests to the city, along with a photograph of the problem and its geo-coordinates. The app is fully integrated in real time with city business applications and the township's online portal.

Street Bump: Improving neighborhood streets is the idea behind Street Bump, a project of the Boston Mayor's Office of New Urban Mechanics and developed by Connected Bits. Residents use the app to record "bumps" which are identified using the device's accelerometer and located using its GPS. The data collected gives the city real-time information it can use to fix problems and plan long-term investments.

Toronto Cycling: This app has a dual purpose of enabling cyclists to track their rides with GPS and help the city of Toronto improve

current cycling infrastructure and plan for future cycling investment. Developed by Brisk Synergies, Toronto Cycling allows users to provide trip information including purpose, route, date and time that will be analyzed to assist in determining high demand corridors used by cyclists.

It's easy to see how cities can save time and energy if citizens report problems rather than crews having to drive around looking for them. You can find more examples of how cities are utilizing citizen reporting in the Council's Smart Cities Apps Gallery.

Not to be overlooked is how opening data makes cities more transparent, and also enables more efficient and cost-effective delivery of public services. In 2012, for instance, San Francisco's Chief Innovation Officer Jay Nath announced that giving the public access to real-time traffic data resulted in 21.7% fewer SF311 calls. He estimated the savings that resulted at more than $1 million a year.

Here's another example: Port Botany is a busy deepwater container port in Sydney, Australia's Botany Bay. Its rail freight operation, according to local reports, was facing congestion and capacity issues – leading officials to contemplate a major infrastructure investment.

But researchers at NICTA – Australia's largest ICT research organization – took real-time data from the port's trains and shipping containers to build a computer model of the traffic. They determined that with scheduling adjustments, the port's rail line wouldn't need an upgrade for another 10 or 20 years. That innovative use of data saved port operators hundreds of millions of dollars, according to one report.

Open data offers insights

Innovative use of data helped port operators in Australia save hundreds of millions of dollars in unnecessary infrastructure improvements.

Open data: So what's the catch?

The advantages seem clear. So why aren't cities everywhere reaping the benefits of opening their data? Turns out, there are many reasons why it's not as simple as it might seem. We'll address them in detail in Chapter 3, but here are six common roadblocks:

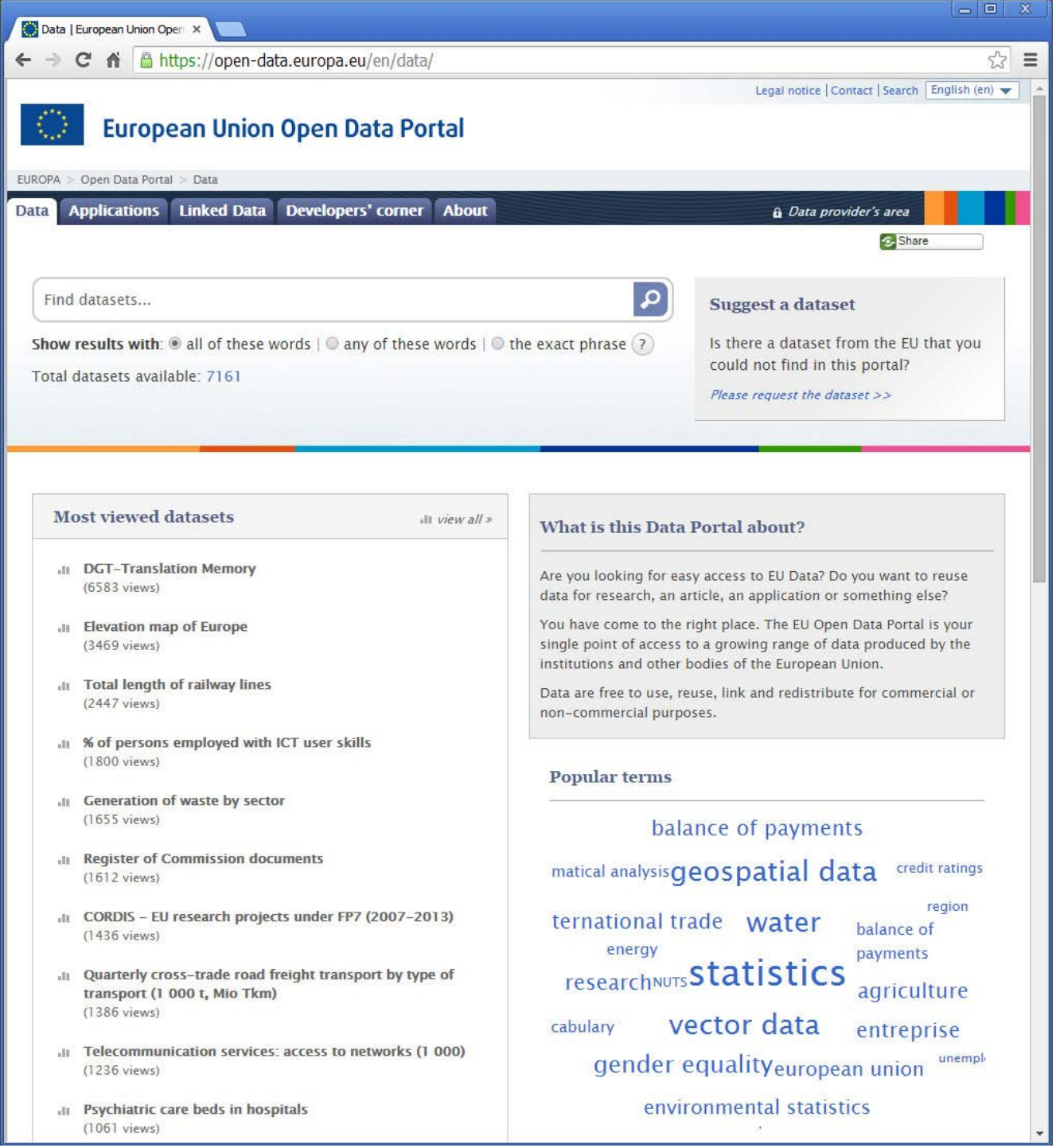
1. **Data isn't available in a releasable form.** This is a show-stopper if you can't provide data sets that are easily accessible and easily used and reused by the public.
2. **Privacy, privacy, privacy.** Between the U.S. National Security Agency debacle, rampant identity theft and some extraordinary credit card breaches at major retailers, citizens are rightfully concerned about loss of privacy. Opening government data will be a red flag for many.
3. **Lack of consistent citywide data governance.** Many cities today remain siloed with limited interaction between departments and between the systems they use. That culture won't work in an open data environment where firm policies on how data is managed must be universally enforced.
4. **Lack of in-house expertise and/or budget.** Numerous companies exist to help cities manage their open data initiatives; the ROI may prove worth the investment.
5. **Cultural mindset at city hall that sees the negatives.** Yes, citizens may see something in the data they don't like – why does that neighborhood get more police patrols than mine? for example – and the calls and complaints will start.
6. **What if we build it and no one comes?** There is the risk that cities will publish data and no one will use it. But starting with data sets that have proven popular in other cities can greatly reduce that possibility.

In Chapter 2, you'll see more examples of why many cities are deciding these challenges are worth overcoming.

CHAPTER 2

WHAT OPEN DATA LOOKS LIKE

The open data discussion is more than just buzz. Eager to deliver more transparent government and enlist citizens in the search for solutions to civic problems, more and more cities are making the data they collect openly available. In this chapter, we showcase the efforts that cities are making to embrace open data.



The EU's Open Data Portal

An open data portal is the gateway to open data resources. The European Open Data Portal shares, among many other things, the most viewed data sets, which range from percent of persons employed with ICT user skills to the generation of waste by sector.

Portals: The gateway to open data

In the municipal arena, the most tangible expression of the open data movement is the open data portal. A portal is simply a website that serves as a gateway to a specific set of resources. An open data portal is the gateway to a city's open data resources.

An open data portal is the main mechanism cities currently use to publish open data for consumption and analysis by citizens, businesses and software developers.

A city might provide access to its open data portal via a tab on its existing website. However, in most instances, the portal exists as its own site or part of a city's "open government" site.

San Francisco Rec and Park App

The San Francisco Recreation & Parks Department wanted a mobile app that delivered park facility data to users. So it partnered with a local mobile platform provider to create the SF Rec and Park App.

Cities not only want to provide data, but enable businesses, citizens and software developers to interact with it. To that end, portals typically provide capabilities that enable the public to visualize data in tables, graphs, charts and maps. Citizens have the power to search, sort and filter data sets to create the views they want, and can even save their personalized data sets to an account.

The European Open Data Portal, among others, shares the most viewed data sets, which range from percent of persons employed with ICT user skills to the generation of waste by sector. The site also prominently promotes the recently updated data sets as well as the top publishers.

We'll discuss portals in more detail in Chapter 4.

Civic data? There's an app for that

Making raw city data available is one thing. Making it sing and dance is another. Civic apps are apps that bridge this gap. Civic apps have the power to access published open data and – in various and creative ways – make it useful and actionable.

Who brainstorms and builds these apps? Sometimes cities do. For instance, the San Francisco Recreation & Parks Department wanted a mobile app that delivered park facility data to users. So it partnered with a local mobile platform provider to create the SF Rec and Park App.

But mostly, cites encourage app developers or activists within their communities to take the lead. For instance, the NYC Developer Portal was specifically set up to help

developers work with New York City's published data sets. More and more cities are also hosting "hackathons," competitive events that challenge groups of developers to utilize civic data to come up with new apps.

Cities are also seeing organized developer groups come together with the purpose of building useful apps that leverage city data. Amsterdam, for example, is exploding with groups promoting and nurturing app development using local open data. The Apps for Amsterdam initiative campaigns for publication of more and more open data in the city and encourages developers to build civic apps that use it.

Amsterdam is also the pilot study site for CitySDK, an effort to provide better and easier ways for cities throughout Europe to release their data in a format that is easy for developers to reuse. Helsinki, Barcelona, Istanbul, Lamia, Lisbon, Manchester and Rome are also partners in the project partly funded by the European Union.

Some apps are homegrown and limited to local concerns, such as the location of a city's dangerous buildings. But other developers create apps that can be widely adopted. For example, Recollect is an app used by a number of cities to remind residents about their garbage pick-up schedule.

App flavors: Web and mobile

Generally, there are two categories of civic apps: web apps, which run as a website, and mobile apps, which run on smartphones, tablets and other mobile devices. Developers may design some apps to work on both platforms.

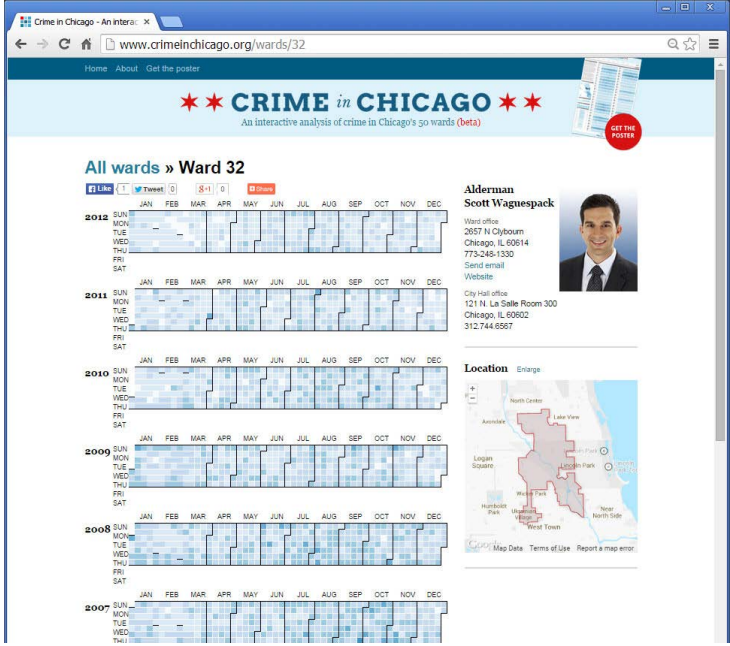
Web apps

For a tour of the web app scene, Chicago is a good starting point. A group called Open City brings together developers, designers, data scientists, policy experts and citizens to work with open data released by local government agencies. The group sponsors a weekly event called Open Gov Hack Night.

For the most part, Open City builds web apps. Here are just a few of them:

Crime in Chicago. This app provides a data visualization that lets people explore crime trends in Chicago's 50 wards. It was built using open data about Chicago crimes released by the Chicago Police Department.

2nd City Zoning. This interactive app provides information on how buildings in the city are zoned, where to locate a business and displays zoning patterns throughout the city.

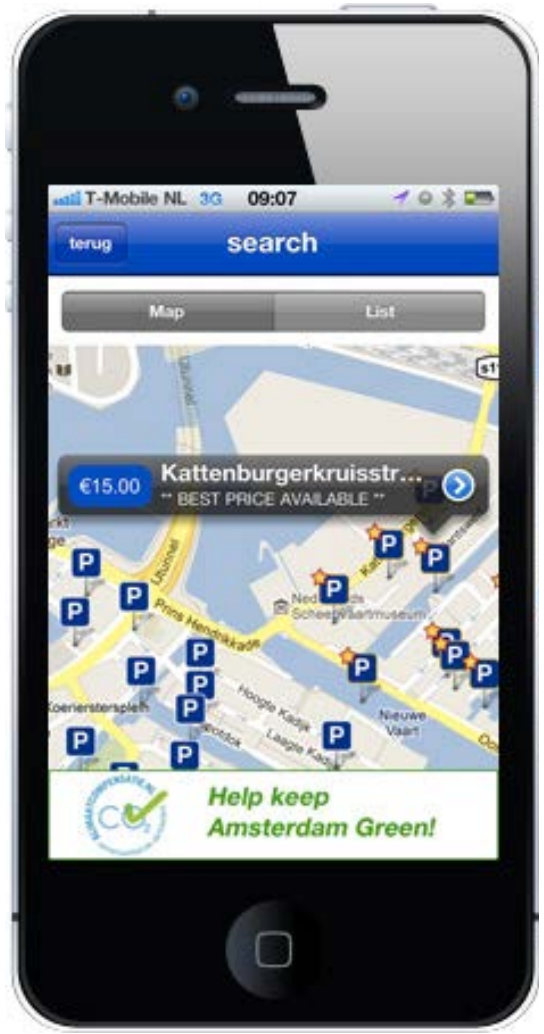


Crime in Chicago

Using open data about Chicago crimes released by the Chicago Police Department, the Crime in Chicago app provides a data visualization that lets people explore crime trends in the city's 50 wards.

Is raw sewage being dumped into Chicago rivers? Sometimes when Chicago gets a lot of rain or there's a significant snowmelt, water-management agencies dump excess wastewater into the lake and river to prevent flooding. This simple app pulls in city data to tell you when that occurs.

How's Business? This app provides a dashboard of Chicago's local economy. It uses open data from the city of Chicago, the



Park Shark Amsterdam

The free mobile app taps into the location of Amsterdam's 3,700 parking meters and the associated tariffs for each meter and helps users find parking spots.

Bureau of Labor Statistics and the Woodstock Institute to show how several economic indicators have been trending since 2005.

As the last app illustrates, the Open City developers do not limit themselves to city of Chicago data sets. They pull in data from county, state and U.S. government portals and dozens of other local and state public agencies, too.

Mobile apps

While many mobile apps are designed to promote civic engagement by encouraging citizens to alert city officials to, say, the pothole they just ran over or a broken traffic light, a good number are also powered by city data. Here are a few examples.

ABQ RIDE: This Albuquerque, New Mexico, transit app uses city data to show the real-time locations of city buses, within a minute's accuracy. Mobile transit apps are widely available.

Help Me I'm Sick: If you're sick in New York City and need to get to a hospital, diagnostic center, or child health center, this app shows you what's available in your borough, along with the address and phone number of each facility.

Msema Kweli: Kenya's open data helped Isaac Osiemo develop a mobile app that helps citizens keep track of Community Development Fund projects. Users can find details of a project they are interested in and share them with others via SMS.

ParkShark Amsterdam: The free mobile app taps into the location of the city's 3,700 parking meters and the associated tariffs for each meter. Users enter their location and where they want to park. The app sifts the data provided by the city and quickly displays a map showing all the parking meters in the immediate area and payment options.

How open data improves livability, workability and sustainability

The Smart Cities Council promotes the use information and communications technologies (ICT) to improve livability, workability and sustainability in cities. Below are snapshots of how apps derived from open data are doing that.

Livability: Tracking dengue fever data to help Singapore residents stay healthy

The incidence of dengue fever has dramatically increased around the world over the past 50 years. Experts believe the mosquito-borne tropical disease now infects 50 to 100 million people worldwide annually. It's estimated that 500,000 of these infections are life-threatening.

Denguelah App

This app utilizes civic data to pinpoint "dengue clusters" in Singapore.

The growth in the number of dengue cases is attributed to combination of urbanization in tropical countries, population growth and increased international travel. And no place fits this description better than Singapore.

In Singapore, thousands of cases of dengue fever or dengue hemorrhagic fever are reported every year. The 2013 dengue outbreak in Singapore was severe. The 2005 record for infections was officially passed in early August 2013 with more than 14,000 people infected. The total number of cases soared past the 20,000 mark by mid-November of that year.

To help residents avoid dengue hotspots in and around Singapore during this period, mobile app developer buUuk stepped in. The company released an app that uses data from Singapore's National Environment Agency to track "dengue clusters" – areas where active disease transmission is occurring. The free DengueLah app pinpoints these areas on a map and reports on the size of the area and number of cases. It includes an alert function.

Workability: City planning data powers home improvement site

Porch

A good example of how city data can lead to business opportunities comes from Seattle, where Matt Ehrlichman uses work permits, professional licenses and other home-construction information gathered by city building and planning departments to power his home improvement site Porch.

The site pulls in a variety of city data, including the addresses for homes under renovation, type of renovation work under way, and the name of the contractor and what they're charging. All of that is combined with photos and other information from industry professionals and homeowners. The result is a searchable database where users can find ideas and costs for projects near their own neighborhood, and recommendations from their neighbors.

The Porch.com website is free for users; industry professionals who want their projects promoted on the site pay a monthly fee.

Sustainability: How an app helps solve water challenges in South Africa

The free Water Watchers mobile app combined with SMS capability and crowdsourcing is enabling South African citizens to report water leaks, faulty water pipes and general conditions of water canals. After taking a photo and answering three simple questions about the particular water canal or pipe, the data is uploaded in real time to a central database. Then the data is analyzed and aggregated into a meaningful "leak hot spot" map for South Africa.

IBM Water Watchers

The city of Tshwane is working with Smart Cities Council member IBM to aggregate "Water Watchers" reports to create a single view of the issues challenging their water distribution system.

The city of Tshwane is working with Smart Cities Council member IBM to aggregate "Water Watchers" reports to create a single view of the issues challenging their water distribution system.

Among those challenges is non-revenue water wastage. An IBM investigation in 2012 found that Tshwane was losing almost $30 million annually in wasted water.

"This project is a natural extension of the work we have done to address non-revenue water in Tshwane with IBM, and as the capital city we will lead the roll out of this program nationally," said Tshwane Executive Mayor Councillor Kgosientso Ramokgopa. "We challenge other cities to join the initiative and help manage this precious resource as best as we can."

The pressure of urban population influx continues to place more strain on aging water infrastructure. According to the 2011 census, 93% of South African households had access to safe water in 2010, but only 45% of those with access to water actually had it in their homes.

Once the data collected from citizens is filtered appropriately, the Water Watchers reports are made available to local municipalities, water control boards and other water system stakeholders, helping them visualize and prioritize improvements to city water infrastructure.

Making city laws easier to understand

The burgeoning open data movement in cities is not limited to publishing crime, budget, traffic and other expected data sets. The American Legal Publishing Corporation and The OpenGov Foundation, for example, are keen to convert municipal codes into more modern, accessible data formats.

The two groups have created the AmLegal Decoder, a tool that transforms municipal laws and legal codes into user-friendly open data accessible via the America Decoded network of legal websites. Using the tool, they have helped launch the site San Francisco Decoded, which carries the tagline, "The laws of San Francisco, for non-lawyers."

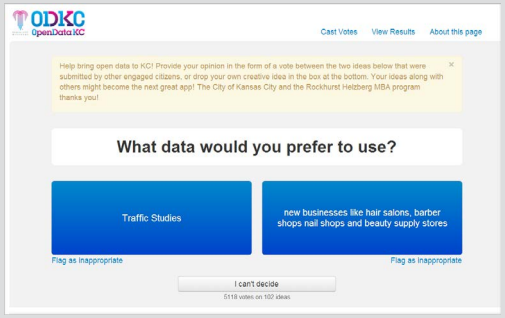
The decoded network also includes sites for the cities of Chicago, Philadelphia, Washington, D.C., and Baltimore. American Legal and The OpenGov Foundation want to expand the network to include up to 2,000 additional American Legal client cities.

The OpenGov Foundation contends that real barriers currently block access to the law at all levels of government. For example:

- Some cities and states outsource the complicated process of updating and organizing the law to experts. Those experts then copyright their part of the process.
- Even when the law is online, websites and paper-based PDFs make it difficult to find what you need, interact with content, or use the data to develop applications that improve the way citizens interface with the law.
- Confusing legal jargon makes it harder for citizens to know and protect their rights.

Conversely, decoded laws enable citizens to understand their rights without having to pay hefty charges or spend countless hours sifting through giant stacks of outdated books at the public library. Developers can also build useful applications with the data.

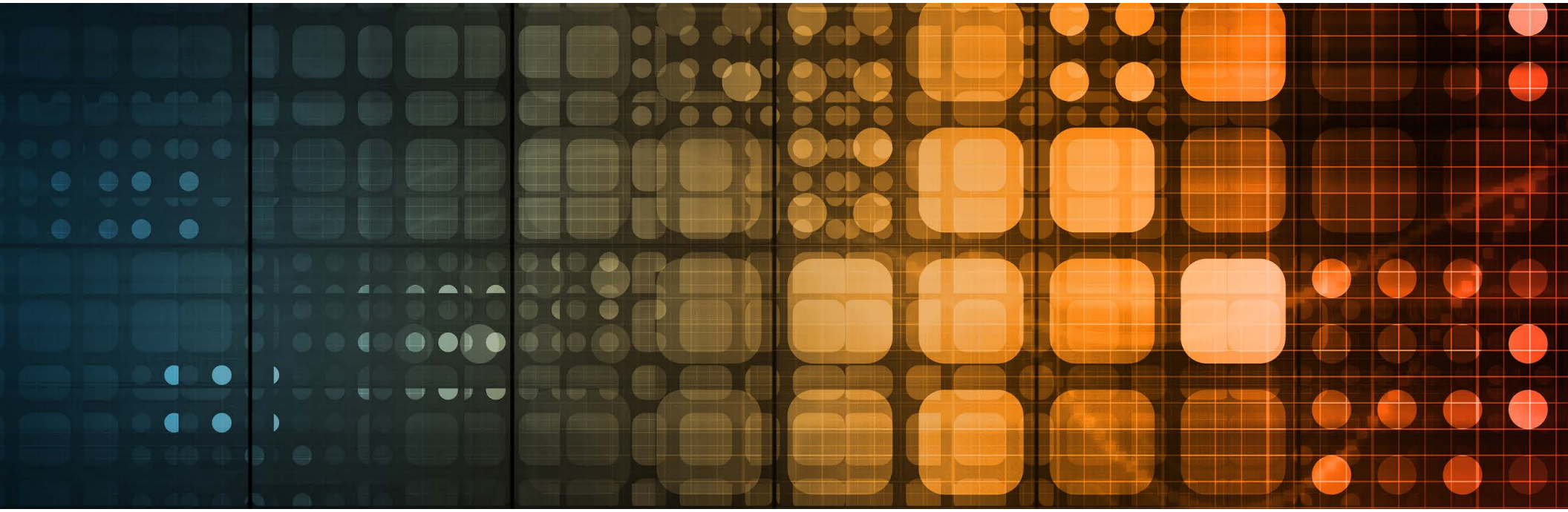
KC HELPS CITIZENS UNDERSTAND OPEN DATA



Kansas City, Missouri, is a strong promoter of transparency and data-driven government. The city has taken extra steps to help citizens see the value of the data it makes available.

The city partnered with a group of MBA students from Rockhurst University to help launch its open data portal. These students also created a series of Open Data KC videos available on YouTube that help citizens understand the concept of open data and how to use the city's open data portal. Videos include instruction on how businesses and neighborhoods can use the data, how to use the city's financial and health data, and a tutorial on how to work with a potholes data set.

The students then helped create a tool that gathers citizen input on publishing new data sets. While most city data portals provide a means for users to request data sets that don't appear on the site, Kansas City polls its portal users about which submitted ideas they like best. The poll uses the wiki survey tool All Our Ideas.



CHAPTER 3

10 STEPS TO DEVELOPING AN OPEN DATA FRAMEWORK

There's good news for cities just now starting to discuss opening up their data. By now, a full arsenal of lessons learned and best practices from cities that blazed the open data trail is available. So there's no need to start from scratch and make the same mistakes they did – and every opportunity to borrow from their successes.

Many city successes with open data have been well-documented by the myriad organizations that have emerged in recent years to champion the cause around the world – from the London-based Open Data Institute to data.gov and Code for America in the U.S., to Open Cities in South Asia and datauy.org in Uruguay. (You'll find an expanded list of organizations supporting open data initiatives and education in the Resources section of this eBook.)

In this chapter, we'll use some of those lessons learned as we take a how-to approach and work through the policies, procedures and technical frameworks that need to be in place to become an open data city. We'll focus on these 10 steps:

1. Form a cross-departmental, cross-stakeholder task force
2. Recruit a high-level sponsor
3. Assess your resources
4. Engage the public
5. Make data privacy and confidentiality a top priority
6. Declare your intentions and draft an open data policy
7. Develop a data governance framework
8. Include data in a rigorous citywide security policy
9. Understand the value of open standards
10. Apply an open data license

Datos Abiertos, Transparencia y Acceso a la información.

Uruguay's open data

Myriad organizations have emerged in recent years to champion the cause of open data around the world; datauy.org in Uruguay among them.

1. Form a cross-departmental, cross-stakeholder task force

The wrong approach: Opening up data? Oh, that's something the IT department needs to handle.

The right approach: Opening up data? All of our departments gather it so we should get together and talk about what we've got and how to make it useful to each other and to citizens.

Regardless of where the impetus to open data comes from – mayor, transit chief, city manager, city hall receptionist, CTO, citizens, local software developer community, etc. – making it happen will eventually require the active participation of stakeholders inside and outside city hall.

But to get started, depending on the size of the city and number of departments, it often makes sense to organize a team that includes representatives from a cross-section of departments. Ideally you want team members who appreciate the value of open data but also have been around city hall long enough to understand its culture. One of this group's early tasks should be to start building a map of city data sets from all departments, highlighting their interconnections and

dependencies. This will be of great help when you start choosing which open data projects you want to initiate and the corresponding data sets that you'll need to release.

But it is also important to invite participation from the community. All categories of users, app developers, data providers, professionals (builders, health care institutions, nonprofits, perhaps insurers, utilities, etc.) – every stakeholder group – should have a requirements-savvy (versus technically savvy) expert advocate involved in the early stages. Also, consider including academics from local colleges and universities and members of the public at large interested in open data and open government.

It will help to have a broad base of community support from the beginning to quell any potential backlash later on.

2. Recruit a high-level sponsor

You want people on your team who understand the city's internal culture, because one of the first tasks this group should undertake is to recruit a high-level sponsor for the open data initiative. It should be someone who shares the vision and has the political capital, charisma and so forth to rally folks inside city hall and in the community to the cause. At this stage, it's not about the technical aspects of opening data, it's about the cultural change or mindset required to develop a data-driven workplace.

There will be resistance. In this age of austerity in government, many staffers will see an open data initiative as more work that will divert time and resources from other responsibilities. The onus will be on the sponsor and the task force to work together to demonstrate how opening data can actually help the city operate more efficiently, reduce workloads and save money.

We mentioned in the last chapter how San Francisco experienced all of that when it released traffic data to the public. Another example is the Dutch Ministry of Education, which published all of its education-related data online. Opendatahandbook.org suggests that since doing so the number of questions the ministry receives has dropped, reducing both workload and costs. And because the data is easy to access internally, questions that do come can be handled more efficiently by civil servants.

3. Assess your resources

Before things get moving too quickly, the task force needs to take stock of the city's ability to move down the open data path with in-house talent – or whether it needs outside help. It's not simply an assessment of technical capabilities at this point; there are cost factors to consider as well as many critical policy issues – from governance, security and privacy to licensing issues that require some level of expertise.

Can you leverage existing solutions?

When possible, using an off-the-shelf solution or repurposing an existing system is a popular choice, since this option typically has the lowest cost and delivers the fastest results. This option isn't for everyone, however. The format of your existing data is one of the primary factors in determining whether this option is even available to you.

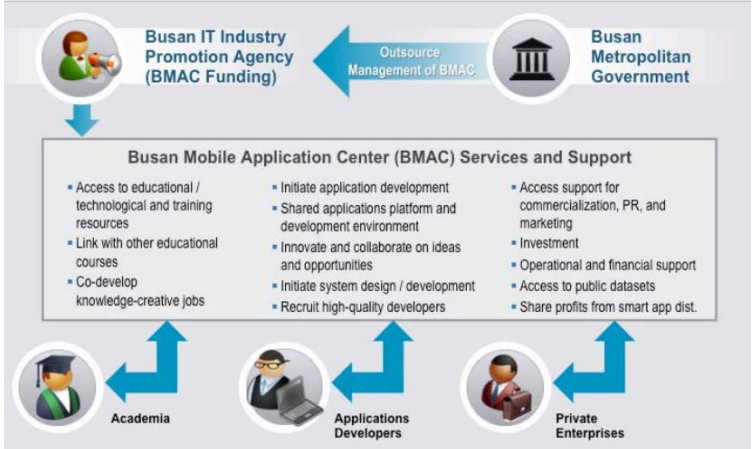
Unrelated data systems typically are not designed to talk to each other. Each system generally has its own proprietary format for storing data. And, in general, the systems store data only in that format; they don't export to a universal format. Often there isn't a universal format.

Meanwhile, developers of open data systems, like any business, want the biggest return on their investments, so they design their solutions with the largest markets in mind. If you use a system that's also used by many other governments and organizations – and you haven't customized that system – you have a much better chance of finding an existing open data solution that will meet your needs.

Consider your entire IT infrastructure

But even if your existing data formats are hard to adapt for off-the-shelf solutions, you may still want to consider this route. An open data project could serve as a catalyst for modernizing your IT, reducing costs and improving service over the long term.

BUSAN'S SHARED DEVELOPMENT PLATFORM



Busan, South Korea, faces challenges similar to those of other large, industrial cities. A primary imperative for Busan is creating job opportunities for its 60,000 annual university graduates and retaining a high-quality workforce.

The Busan Metropolitan Government recognized the potential for growing its economic base through the use of ICT. By connecting citizens, educational institutions, government agencies and industry, the city could drive sustainable urban development while providing citizens with easy access to city services.

A 10GB broadband infrastructure, the Busan Information Highway, was already deployed and linked 319 public institutions. This infrastructure gave the Busan government a strong foundation for expansion. For assistance, Busan turned to Council member Cisco and Cisco Smart+Connected Communities solutions to develop a cloud infrastructure strategy.

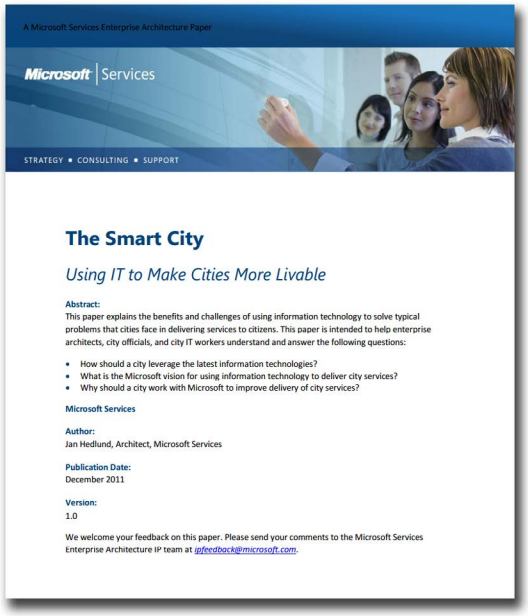
Today the cloud connects the Busan Metropolitan Government, the Busan Mobile Application Center (BMAC), and five local universities. BMAC offers physical workspaces, such as project and meeting rooms, shared application development, cloud platforms for Windows and Mac OS operating systems, an applications library, a consulting center for start-ups and small-office/home-office professionals, testing tools, smart devices, application programming interfaces for access to municipal data, an application developer's forum and marketing resources.

The shared platform as a service (PaaS) provides developers with convenient access to municipal data from the city's geographic information and intelligent transportation systems. Using this data, developers can create innovative applications that help improve city operations, quality of life and citizen access to services.

Since the BMAC's opening, cloud development community membership has grown from 500 to 1,500, with 100-220 simultaneous users of the platform. The center held its first Mobile App Contest and received 115 apps or application development ideas. Prizes totaling 26 million KRW (U.S. $23,686) were awarded for 14 new apps. In the first year of operation, 840 people registered for professional development courses and seven new businesses registered as start-ups. As of February 2012, BMAC had trained 2,350 people, and 3,150 individuals registered as professional mobile application developers in the BMAC talent pool.

Eventually, the cloud platform is intended to deliver services to citizens through kiosks, citywide digital interactive displays, home-based access and mobile access.

With a shared development platform, developers can work with the city to co-create smart city services. The Busan Metropolitan Government plans to establish a public-private collaboration company to create, deliver and manage innovative urban services. In addition, the city is encouraging a greener city environment through increased citizen engagement.



A Microsoft Services Enterprise Architecture Paper

Microsoft | Services

STRATEGY ▪ CONSULTING ▪ SUPPORT

The Smart City

Using IT to Make Cities More Livable

Abstract:
This paper explains the benefits and challenges of using information technology to solve typical problems that cities face in delivering services to citizens. This paper is intended to help enterprise architects, city officials, and city IT workers understand and answer the following questions:

- How should a city leverage the latest information technologies?
- What is the Microsoft vision for using information technology to deliver city services?
- Why should a city work with Microsoft to improve delivery of city services?

Microsoft Services

Author:
Jan Hedlund, Architect, Microsoft Services

Publication Date:
December 2011

Version:
1.0

We welcome your feedback on this paper. Please send your comments to the Microsoft Services Enterprise Architecture IP team at *ipfeedback@microsoft.com*.

Microsoft's White Paper

"The Smart City: Using IT to Make Cities More Livable " guides cities through an assessment of their current IT systems.

Smart Cities Council member Microsoft prepared a white paper called The Smart City: Using IT to Make Cities More Livable to guide cities through an assessment of their current IT systems. In short, every day your IT staff is forced to balance multiple demands, a balancing act that's even more difficult if every department has its own system. By bringing those systems to a common platform first, your IT department will run more efficiently thanks to the benefits of economies of scale, and you'll have a much more solid foundation to launch your open data efforts.

What will it cost and how long will it take?

The cost and timeline vary based on the amount of effort needed to adapt your data into the format needed by off-the-shelf solutions and how much data you want to make available. Here, though, are some average cases to serve as a benchmark.

Strathcona County in Alberta, Canada, provides nearly three dozen data sets through its Open Data Portal. The portal cost $75,000 to open, including consulting costs and IT services. To maintain the portal and provide ongoing public access, the county pays an annual hosting fee of $25,000.

The ongoing hosting costs are higher for portals that provide more data. The state of New York paid nearly $50,000 in hosting fees during the first year of its OpenNY portal. That portal launched with 244 data sets available to the public and grew to more than 700 available a year later.

The top factors that affect the timeline are the number of data sets you want to make available at launch, the amount of effort required to convert your data into a format usable by the open data system, and the clarity and level of consensus around your open data vision. That said, for most projects leveraging existing technology, two to three years is a reasonable target.

The city of Providence, Rhode Island, has undertaken a large effort to improve transparency, and one element of that project is an open data website. It spent 11 months preparing findings and recommendations. Eighteen months after the report was made final, the city's open data portal opened to the public. It took six months to prepare 100 data sets for the portal.

Another approach to consider is whether the city should provide a Platform as a Service (PaaS) model that enables and incubates an ecosystem for developing applications utilizing city data. In some cases this approach can be beneficial, especially in situations where the ecosystem resources are constrained. (See sidebar on how Busan, South Korea used this approach on the previous page.)

Are custom-built solutions the answer?

Custom solutions are typically more expensive than existing solutions. But they may still make financial sense if it would be prohibitively costly to migrate your data to a format that can be used, or if you want to present a unique type of data in an innovative way.

A custom solution can meet your requirements in ways no pre-made solution can, since it is tailor-made for your needs. Building your own solution is not without its own drawbacks, however. Any system that you build yourself will not be tested as well as a system that is used by many different organizations. Additionally, custom solutions are almost certainly more difficult to support. Also important to note, pre-made solutions are often easier to use since a wide base of users are available to suggest enhancements.

You may want to consider a custom solution if you cannot find an existing one that meets at least 80% of your requirements. The 80% threshold is not a hard-and-fast rule, but it is a good point at which you should start asking questions. Are the requirements that aren't met with existing solutions truly showstoppers? How much would it cost to adapt existing solutions to meet your unmet requirements? The answers to those questions will guide your course of action.

Cost and timeline for custom projects

Because of the unique nature of custom projects, it's impossible to provide a yardstick for the cost. In fact, the cost can present a sizable risk to the overall project. Since every project is unique, it can be difficult to perfectly scope the work before it begins.

As hidden issues are uncovered throughout the course of development, project costs can balloon. If the work is well under way, paying up may be your only option.

The same knowledge challenges that pose budgetary risks can also derail your timeline. It's important to have an understanding of the potential for unknown risks before setting a schedule.

Should you do it yourself?

One way to reduce the overall cost and budget risk is to do the work yourself using in-house talent. Your staff likely knows your data better than anyone else, and taking advantage of your own resources can reduce the amount of money needed to get an open data project started.

Before heading down that path, however, it's critical that you assess whether or not your staff is up to the task. The skills needed to maintain legacy systems are not necessarily the same skills you need to build a useful open data portal. If your staff is lacking skills in too many areas, you may waste time and resources while they try to reinvent the wheel.

Here are some questions to ask:

Does your staff really have the time to take on the project? If your resources are already spread thin, either your open data project or their existing work will suffer.

Is your staff well-versed in broad industry open data best practices? If not, you could waste resources as they try to catch up, or end up with a site that has security risks or limited functionality.

Does your staff have the time and skill to document the work? Thorough documentation is vital to being able to support and build upon the site later. Without documentation that shows how the project was built, you could end up needing to rebuild or reverse engineer it later if you need to fix issues or add features.

4. Engage the public

Before you simply announce that your city is going to open up its data, there should be an effort to raise public awareness about the opportunities open data provide and to solicit input on some of the policies you will be drafting as part of the initiative – privacy rules and data governance, for example.

During this process task force members and your high-level sponsor should showcase how citizens and businesses in other cities have benefited from open data – for example, they could highlight apps developed for other cities that address well-known pain points in your community.

Another key will be to share specifics on how other cities have implemented open data policies and outline some of the major decisions that will need to be made by your task force and/or elected officials. Answer questions, solicit input and encourage ongoing two-way communication with

community members about your city's plans and progress. Welcome their ideas about apps and other uses of open data they would like to see.

The logistics of this public engagement process will need to reflect what works best in your city, but ideally will occur over multiple platforms to ensure the widest possible participation – from public meetings to social media to online polling, digital suggestion boxes and the like.

5. Make data privacy and confidentiality a top priority

Big data and open data create multiple opportunities for data collection, capture and analysis of private citizens. Written policies regarding civil liberties, digital and data rights, consumer protection and privacy laws are necessary to create fairness, equity and transparency of digital data collection, storage, analysis, sharing and release.

The number and extent of egregious data breaches occurring in both private and public sector organizations in recent years have citizens rightfully alarmed about sloppy data protection policies that jeopardize their privacy and the confidentiality of data collected from and about them.

In 2012, the Obama administration proposed a framework for a Consumer Privacy Bill of Rights regarding data that emphasized transparency, control and accountability. Two years later, the White House released a Big Data Report that again called for Congress to pass a Consumer Privacy Bill of Rights. It highlighted five other policy recommendations relating to data:

- Pass national data breach legislation
- Extend privacy protections to foreign individuals
- Ensure that student data is collected only for educational purposes
- Increase technical education to reduce discrimination
- Amend the Electronic Communications Privacy Act

Fortunately, U.S. cities don't need to wait for Congress to act. Bringing citizens, businesses and other stakeholders together to craft a citizen bill of data rights as a centerpiece of your city's open data initiative is a bold and refreshing way to gain citizen confidence.

The timing will be important. Having a public conversation with community members about open data and privacy before you formally announce your initiative may be the best course of action. What you learn will certainly help inform the open data policy and governance framework discussed in the next two chapters.

UK's Information Commissioner

In the UK, an independent authority upholds information rights in the public interest, promoting openness by public bodies and data privacy for individuals.

The following examples of data privacy initiatives from around the world may prove useful:

- The Italian Data Protection Authority was set up in 1997 to protect fundamental rights and freedoms in connection with the processing of personal data, and to ensure respect for individuals' dignity.
- UK Information Commissioners Office is an independent authority set up to uphold information rights in the public interest,

4 PRINCIPLES OF DATA PRIVACY AND CONFIDENTIALITY

A white paper on data governance from Council member Microsoft outlines four general principles around data privacy and confidentiality that apply in most organizations.

Principle 1: Honor policies throughout the confidential data lifespan:

- Process all data in accordance with applicable statutes and regulations.
- Preserve privacy and respect individuals' choice and consent in the collection, use, sharing, and disclosure of customer, partner and employee personal information.
- Systems should provide notice of data collection, use, disclosure and redress policies.
- Confidential data should be tagged when collected, generated, or modified, in accordance with organizational policy.
- Machine-readable data privacy policies must be available in digital form.
- Systems should provide individuals with access and capabilities to correct information as applicable.
- All confidential data types should have a clearly associated retention policy and disposal procedures.

Confidential information will be transferred to and stored in facilities/geographies that meet applicable laws and regulations.

Principle 2: Minimize risk of unauthorized access or misuse of confidential data:

- **Information protection:** The system provides reasonable administrative, technical, and physical safeguards to ensure confidentiality, integrity and availability of data. This includes the ability to detect and prevent unauthorized or inappropriate access to data.
- **Data quality:** The system should maintain accurate, timely, and relevant data, and this capability should be verifiable.
- **Principle 3:** Minimize impact of confidential data loss
- **Information protection:** Systems should provide reasonable safeguards (i.e., encryption) to ensure confidentiality of data if it is lost or stolen.
- **Accountability:** Appropriate data breach response plans and escalation paths should be in place and documented for all relevant data. All organization employees likely to be involved in breach response should be trained appropriately in these plans and the use of the escalation paths. Appropriate breach notification plans should be in place for all relevant data.

Principle 4: Document applicable controls and demonstrate their effectiveness:

- **Accountability:** Adherence to data privacy and confidentiality principles should be verified through appropriate monitoring, auditing, and use of controls. Plans and controls should be properly documented.

Compliance should be verifiable through logs, reports and controls. The organization should have a process for reporting non-compliance as well as a clearly defined escalation path.

promoting openness by public bodies and data privacy for individuals.

- Australian Privacy Act includes 13 principles that apply to the handling of personal information by most Australian and Norfolk Island government agencies and some private-sector organizations.
- Hong Kong Personal Data (Privacy) Ordinance represents one of the more advanced data protection regulatory frameworks in Asia and has existed since 1996.

6. Declare your intentions and draft an open data policy

There are several approaches to declaring that your city's data is open. It can start with a city council resolution or an executive order, followed by a written policy. Or the policy can come first, becoming the basis of an ordinance that makes open data the law. San Francisco did both; it declared data open by executive order in 2009 and followed the next year with an ordinance.

A study of seven North American cities that took early action to develop public data programs conducted in 2013 by the San Diego Regional Data Library (SDRDL) found mixed approaches:

By resolution: Vancouver, B.C.; Portland, Oregon; Austin, Texas

OAKLAND'S COLLABORATIVE APPROACH

Oakland, California's open data policy, adopted in 2013, was drafted in a collaborative manner. The city's Urban Strategies Council organized a public roundtable and created an online Google Hangout. The council invited experts and interested parties from around the country to join in developing policy.

A collectively written draft was then uploaded and shared as a Google doc, and anyone interested was invited to edit the document and comment on it. The community-created draft was also included as part of the finalized proposal that was presented to the city council to illustrate the community's instrumental role in drafting the policy.

"The actual process of creating this open data policy was itself truly open and community-oriented," said Steve Spiker, Research and Technology Director at the Urban Strategies Council, who originated the concept of a community-drafted open data policy. "It was inspiring to see how committed the people of Oakland are to making government more transparent, accountable and collaborative."

By executive order: San Francisco, Philadelphia, Chicago

By ordinance: San Francisco, New York

By policy: Washington, D.C.

Regardless of which order you do things in – declare first or draft first – an open data policy is foundational. It formally defines what data should be public, the manner in which data is made public, and how the policy is implemented. Moreover, it sends the signal that a city is serious about open data.

Drafting the policy may require expanding your original task force to include people with specific knowledge or expertise in key policy components – privacy issues, IT security, licensing and legal matters, etc. And, as Oakland demonstrated (see previous page), there is also great value in bringing community members into the discussion.

The SDRDL study mentioned above examined common (and uncommon) elements in city open data policies and developed recommendations for cities in its region to follow. They provide a good starting point for cities everywhere. Below is a breakdown of the SDRDL's suggested open data policy components; visit this page for additional details. (You'll also find links to other sources in the sidebar.)

Motivations

Policies typically begin by stating reasons for opening data, the most common being:

- **Transparency:** Increasing government openness and the availability of information about government and its proceedings.
- **Participation:** Allowing and encouraging citizens to participate in government and civic life.
- **Collaboration:** Improving the extent to which city departments work together, or how the city government works with private organizations.
- **Innovation:** Interest in civic applications, new ideas and new solutions to problems.
- **Progress:** Civic development, economic improvement or other aspects of community growth.

Staff and organization

Policies typically address how city departments will alter their staffing to accommodate new obligations under the open data policies. Since cities vary greatly in size, departmental organization and the like, so will their organizational structure when it comes to managing open data. But here are some common approaches identified in the SDRDL study:

- **Department data officer:** Departments are directed to assign a person to be the liaison

RESOURCES TO HELP YOU FRAME AN OPEN DATA POLICY

There's no shortage of information to help cities develop an open data plan. Below are useful policy-oriented resources from governments and open data advocacy groups.

- Philadelphia Open Data Guidebook
- New York City Open Data Law
- Toronto Open Data Policy
- London Code of Practice
- U.S. Open Data Policy
- G8 Open Data Charter
- Sunlight Foundation Open Data Policy Guides
- Open Knowledge Foundation Open Data Handbook
- Data.Gov.UK
- G8 Open Data Charter: Canada's Action Plan
- Project Open Data: tools, case studies, implementation guidance

or manager for the department's open data efforts, usually reporting to an advisory committee.

- **Chief data officer:** Establish a role to head open data efforts across the municipal governments. Chairs the advisory committee, if it exists.
- **Advisory committee:** Create an advisory committee at the municipal level to oversee the entire program. This may be what the task force evolves into.

Administration

This refers to the administrative efforts required to manage the open data program. Common categories include:

- **Respect privacy:** Considering privacy and existing restrictions on releasing information is a requirement for any new policies.
- **Reasonable effort:** Use a "reasonable effort" standard to guide departments in how much effort to expend, but also require justification for why a dataset cannot be released. These justifications should be public and open for comment.
- **Require open formats:** Require that data sets be released in the most open forms possible. CSV is preferred to Excel, and Excel is preferred to PDF.
- **Create guidelines:** Require that the chief data officer and the advisory committee produce a guideline document for both the administrative and technical aspects of releasing data. Define a schedule by which the documents will be completed, and another schedule for when departments will implement the guidelines.
- **Require updates to data:** No data set that is regularly updated within the department should be updated on the public repository less frequently than once per quarter.
- **Use an open source repository:** Set up a data portal, preferably CKAN (an open source data portal software). The site should be hosted on the city's domain name at http://data.<citywebsite>.

Specify which data sets you will release

City open data policies vary regarding which data sets are released. Some specify that all the data a department controls will be released; others specify specific data sets.

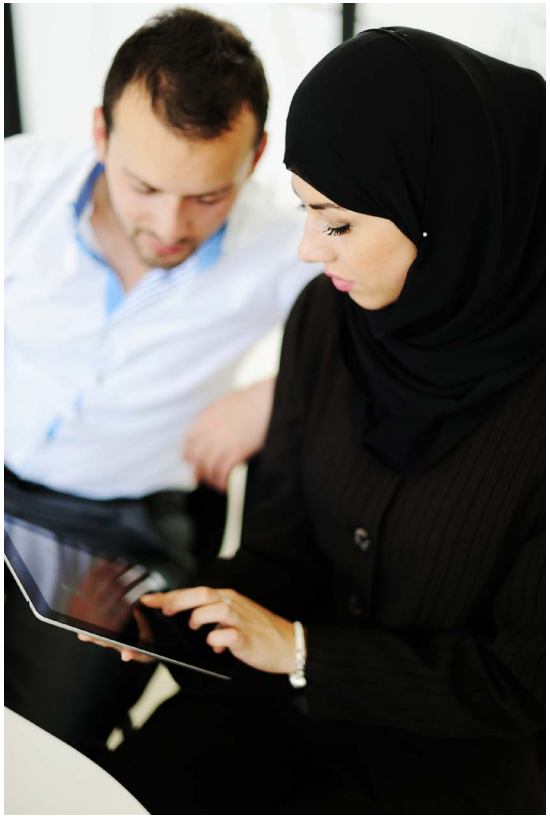
- **Form of publication:** Nearly all of the policies that SDRDL studied specified that data will be released in an open, non-proprietary format. Some also mention open source or explicitly name the URL where data will be published. Language may describe the formats in which data will be published as "open," "searchable," "usable," "easily analyzable."

What data is released

This is the category where SDRDL found the biggest variation between the city policies it reviewed. Some specify that all the data a department controls will be released, while others specify specific data sets. The SDRDL recommendations below may help your team formulate how it wants to proceed:

- **Require inventory and release:** Require departments to inventory all data that they control and identify the effort required to make each dataset available for release. Require justification for any data sets the department does not think should be released.
- **Set a schedule:** Set a schedule for both the initial inventory and the first three data sets that the department publishes.
- **Make inventory public:** Require that the inventory document itself be released as data, and invite the public to participate in determining the priorities to release data sets that are not yet available.
- **Require contractors and partner agencies to release data that the city uses:** Don't allow commercial or intergovernmental relationships to become barriers to publishing public data.
- **Err on the side of openness:** All data that a department controls should be considered releasable unless there is a good justification for why it is not.

With so many models available today, the task of developing an open data policy shouldn't be a barrier to a more open and transparent city government.



The next big data frontier

Now that data has emerged as a useful, actionable asset, public agencies are starting to see the barriers that poorly managed data present to realizing its full potential. That's why some call data governance the next big frontier for the public sector.

7. Develop a data governance framework

There's another piece of policy that needs to be addressed in relation to opening up data. It is essential to establish rules and standards for managing data. The ultimate goal is to ensure that the most complete, accurate and up-to-date data is available.

So what is data governance?

Doug Robinson, executive director of the National Association of State Chief Information Officers (NASCIO), calls it the next big frontier for the public sector.

Now that data has emerged as a useful, actionable asset, public agencies are starting to see the barriers that poorly managed data present to realizing its full potential.

"There's a lack of standards and a lack of consistency," Robinson told Colin Wood of govtech.com. "There's certain data quality issues: Some of the data is dirty and messy and it's non-standardized. And that increasingly has made data sharing very difficult because you have language and syntax differences, the taxonomy on how information is represented. And there's a lot of cultural and folk-law around the sharing of information. All that is problematic because there's no overarching data governance model or discipline in most states. Data governance isn't very mature in state

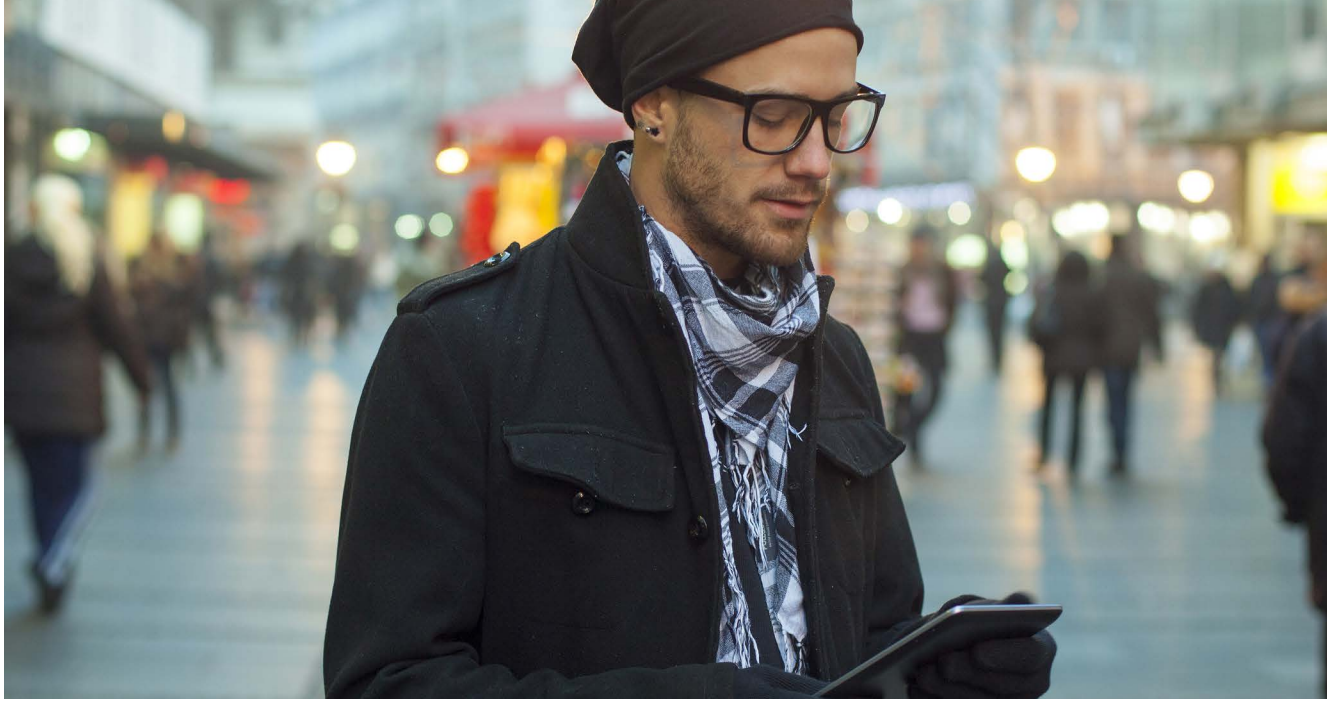
government nor local governments today, and certainly not the federal government."

So data governance is about tidying all of that up; about putting controls and best practices around data into a framework that can be shared, reused and safeguarded. These best practices call for a clear governance directive that:

1. Establishes the chain of authority and control over data assets
2. Spells out who makes access decisions and who determines accountability

This citywide policy should cover both private and public data and ensure that data from each department is made available to others and ideally with other agencies where information sharing is relevant. It must also align with the policies in the security and privacy targets discussed in the following section.

A citywide data governance framework will increase the city's agility (ability to quickly build new applications as needed) and accuracy (by ensuring everyone is working with correct data). It can also lower costs by reducing errors and eliminating unnecessary duplication. A citywide plan also makes it much easier to enforce privacy and security best practices.



8. Include data in a rigorous citywide security policy

Privacy is freedom from public scrutiny. Security is freedom from danger and for that a city needs a rigorous, citywide security policy that includes all of the data it collects, stores and shares. In an open data environment, it is essential that cities take security precautions that prevent the accidental release of any data that can identify individuals. For example:

Personally identifiable information (PII): This refers to information that can be used to distinguish or trace an individual's identity, either alone or when combined with other personal or identifying information that is linked or linkable to a specific individual. PII requires a case-by-case assessment of the specific risk that an individual can be identified. In performing this assessment, it is important for cities to recognize that non-PII can become PII whenever additional information is made publicly available (in any medium and from any source) that, when combined with other available information, could be used to identify an individual.

Mosaic effect: The mosaic effect occurs when the information in an individual data

Prevent accidental release of PII

The importance of preventing the release of personally identifiable information (PII) can't be overstated. Cities must adopt and enforce a rigorous, citywide security policy that includes all of the data it collects, stores and shares.

set, in isolation, may not pose a risk of identifying an individual (or threatening some other important interest such as security). But when combined with other available information, there is such a risk. Before disclosing possible PII or other potentially sensitive information, agencies must consider other publicly available data – in any medium and from any source – to determine whether some combination of existing data and the data intended to be publicly released could allow for the identification of an individual or pose a security concern.

It's best not to leave it to each individual department to come up with a security plan. Instead, implement and enforce best practices citywide. A security policy should use a risk management framework that continually assesses vulnerabilities. Risk management is the identification, assessment and prioritization of risks, combined with a plan to minimize their impacts. Risk management continues throughout the technology lifecycle and drives the evolution of security protocols and practices.

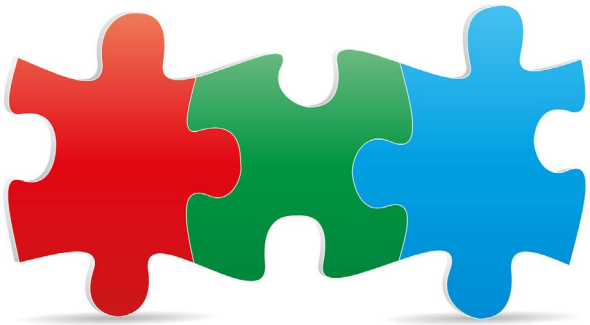
A smart city's risk management framework must be comprehensive, encompassing the cybersecurity as well as the physical security of all assets. The framework should encompass not just the necessary technical steps, but also a thorough program of education and training. (Many famous security breaches were launched with the help of "social engineering" to convince a naive person to take a step that made the system vulnerable.)

Risk management cannot avoid all risk, but it can minimize adverse effects. It lessens unwelcome surprises, assists in correct prioritization and reassures citizens. A security framework is a combination of well-defined policies, procedures, standards and guidelines that provide consistency citywide. It also promotes a proactive approach to security, identifying and mitigating threats before they occur.

9. Understand the value of open standards

"A standard is nothing more than an agreement on rules to achieve some level of order. If you like anarchy and/or chaos, standards may not be of much importance. If you like some level of order, such as being able to go to any tire store anywhere in the world and buy tires that fit your vehicle, regardless of manufacturer, then you probably think standards are a good thing."

– Carl Reed, CTO of the Open Geospatial Consortium (a Council advisor)



As one who has been involved in various standards activities for 20 years, Reed maintains there should be no question about the value of standards; the value and economic benefits have been documented many times over. In fact, he says, "In the U.S. alone, billions of dollars in benefit, reduced profit, additional costs and so forth are lost each year simply due to data silos, lack of interoperability in workflows and so forth."

From another perspective, the UK Government Cabinet Office suggests that by implementing its Open Standards Principles for software interoperability, data and document formats, government bodies are supporting the delivery of:

- A level playing field for open source and proprietary software providers competing for government IT contracts
- Improved flexibility and ability for government to cooperate with other bodies, citizens and businesses
- More sustainable cost in government IT projects

Open standards level the playing field

Implementing open standards for data, software interoperability and document formats has multiple benefits for public sector agencies.

Rather than spending taxpayer dollars to reinvent the wheel in every city, one of the promises of open data is the ability to share apps, for example, between cities and other public agencies. But that requires cities to use the same data schema, which is often not the case.

The reality today is that a hodge-podge of data set formatting reduces the ability to share data. And this hodge-podge often exists within cities, which means one department's data can't easily integrate with data from another department, much less between external agencies. All of which impedes not only an open data initiative but the highest and best use of existing data.

Here's an example: An InformationWeek article suggests that in the U.S. alone, "more than 17,000 state and local law enforcement agencies (are) working with IT systems that don't communicate with each other. The constellation of clues and evidence related to criminal activity is often spread across disconnected databases and paper files in thousands of local, state and federal agencies." When databases don't talk to each other, it's harder to catch the bad guys.

Data encoding standards, data (and service) access interface standards, and metadata standards are all part of the solution. Experts do expect to see rapid technical progress in the sharing of unstructured data. Linked data, RESTful programming approaches and Hadoop offer ways of processing, accessing and integrating vast quantities of heterogeneous data stored in diverse formats. These developments are going to impact information technology standards and openness policies.

Hodge-podge of data set formatting inhibits sharing data

It is said that in the U.S. alone, more than 17,000 state and local law enforcement agencies work with IT systems that don't communicate with each other, making it more difficult to share clues, evidence and the like.

The goal for a city that opens up data for public use is that it should be provided in machine-readable formats to allow for greatest reuse. Here's an illustration of why that's important from the Open Data Handbook:

Consider statistics published as PDF documents, often used for high-quality printing. While these statistics can be read by humans, they are very hard for a computer to use. This greatly limits the ability for others to reuse that data.

That said, the Open Data Handbook also suggests that it is better to give out raw data now than perfect data in six months' time.

10. Apply an open data license

Providing licensing gives those who want to use and reuse your city's data clarity and certainty about their entitlements. The license should be as restriction-free as possible to encourage widespread use.

For example, while there are a few conditions, the city of Toronto's license states: "You are free to copy, modify, publish, translate, adapt, distribute or otherwise use the Information in any medium, mode or format for any lawful purpose."

The Open Data Commons has published open data licenses that cities can study or adapt. One is Public Domain; the other is Share-Alike (plus Attribution).

CHAPTER 4

WITH OPEN DATA, PRESENTATION IS EVERYTHING

The primary goal for opening data is to make it usable, used and reused. In this chapter we highlight some of the platform options cities have for doing that as well as the various types of data cities commonly publish to their data portals.

Previously we discussed how open data portals serve as the gateway to a city's open data resources. Creating your portal will require a data management platform. Cities have two basic options here: a data sharing solution that they build, operate and maintain in-house – or a solution that uses a cloud-based platform. Many cities with portals have found that the speed, scale and economics of doing their data sharing in the cloud makes it the more attractive choice.

There are many platform providers for governments. CKAN, for instance, is open source, free software from the Open Knowledge Foundation (OKF), a UK-based nonprofit. There are no license fees. Users can get hosting and support from a range of suppliers, and OKF provides a robust application programming interface (API) so that developers can build apps that pull in data published by cities. OKF also offers CKAN Express, a managed, cloud-based solution designed for government data portals.

Other platforms in use include DataPublic, a web portal framework built on the Drupal 7 open source content management system. OpenGov is a platform cities use that specializes in sharing and analyzing financial data.

Open source portal

The city of Hamburg, Germany launched a data portal in February 2013. The portal uses CKAN, the open source, free software from the Open Data Foundation, as its back-end.

Open data catalogs

The municipality of Gortynia in Greece launched its open data catalog in April 2014. Much of the data on the site initially is Gortynia's open geospatial data..

Anatomy of a data portal

The collection of data a city makes available at its data portal is typically referred to as the city's data catalog. A specific listing or resource in the catalog – for example, a city's open geospatial data – is known as a data set.

types of data, or record certain data in a different way, than another city. Cities that have operated a portal for a longer period may have published hundreds of data sets while those just launching their portal may have only a couple dozen. Cities tend to post data sets based on what they perceive will interest the public most or to meet requirements of any open data policies they have adopted.

In addition, cities have genuine limits to their publishing capacity. Data often needs to be cleaned up and recreated in usable formats before it can be pushed out to a portal. All of that takes time.

While cities may have a schedule for adding new data sets, portals usually provide a form that enables citizens to request and campaign for publishing data sets not currently available on the site.

Types of open data

As already noted, data catalogs differ from one city to the next. However, there are certain types of information that most cities publish to their portals. Crime statistics, building permits, traffic counts that sort of thing. Data sets are typically categorized

COMMON CITY DATA SETS

The U.S. City Open Data Census scores city open data progress based on 18 categories of data sets. Their "landscape list" includes:

1. Asset disclosure
2. Budget
3. Business listings
4. Campaign finance contributions
5. Code enforcement violations
6. Construction permits
7. Crime
8. Lobbyist activity
9. Procurement contracts
10. Property assessment
11. Property deeds
12. Public buildings
13. Restaurant inspections
14. Service requests (311)
15. Spending
16. Transit
17. Zoning (GIS)
18. Web analytics

along standard departmental lines such as financial, public safety, public works, parks and recreation, regulated businesses, transportation, etc. But other types of data are worth considering too.

Budget data. Because a city budget reveals much about a city's commitment to government transparency, making detailed budget data available through a portal is often a high-priority, high-visibility open data project. For example, Los Angeles Mayor Eric Garcetti developed a special city budget site that's separate from the city's open data portal. Built on the cloud-based OpenGov platform, the budget site lets citizens review the city's finances via interactive graphs of the current and past budget, including multi-year trends and departmental revenue and expenditure details. Others cities, including Edmonton and Palo Alto, have also made special efforts to add interactive city budget information to their open data initiatives.

311 data. A number of cities enable their portal visitors to view requests received through the 311 service – which captures non-emergency calls for such things as debris in roadways, non-working traffic lights, noise complaints, potholes and reporting stolen vehicles. It's common to find cities of all sizes – from Somerville, Maryland, to New York City – making their 311 requests available on their open data sites. Some cities also offer a 311 mobile app that connects directly to their open data platform.

Map data. Many cities capture geographical data for their jurisdictions using geospatial information systems (GIS). And those with open data portals usually try to make this spatial data available to the public and to application developers for displaying map data. The Los Angeles County GIS Data Portal and Palo Alto's Open GIS are examples of separate portals maintained by municipalities.

Performance data. Open data published to a portal doesn't communicate by itself how well a city is performing. It's largely raw data. To help citizens see how well (or not) a city is measuring up to its established goals, some cities have developed sites dedicated to publishing performance data. They serve as scorecards, exposing select city data in key areas. For example, in Kansas City, the data-powered KCStat online dashboard lets citizens monitor the progress of the city council's 24 strategic priorities. And Boston recently launched Boston About Results (BAR). Through a website and mobile app, BAR presents, for example, snapshots of monthly crime statistics and compares those numbers with the city's established benchmarks.

CHAPTER 5

NOW THE FUN BEGINS: PICK YOUR FIRST PROJECT

With policies and procedures written and a portal in the works, now you're ready to plan your first open data project. In this chapter we'll describe steps involved, from identifying potential projects to a communications plan to measuring results.

Host a hackathon

More and more cities are inviting software developers to overnight hacking events where they focus their brainpower on city data sets that can be transformed into useful tools that improve their city's livability.

In this section we'll focus first on three important steps involved in launching and assessing your first open data project.

- Identify potential projects
- Choose your first project strategically
- Develop a communications plan

1. Identify potential projects

As your task force worked on setting up the framework for your open data initiatives, chances are it identified some projects of interest. Even so, it's worthwhile to solicit suggestions to ensure that a wide range of stakeholders are involved and enthusiastic about what you're doing. It's important that you score some early wins to validate the initiative. So you might consider:

- **Accepting nominations from all city employees:** The people on the front lines will have a good sense of what kinds of questions and problems they hear most often from members of the public, businesses, etc. Since improving delivery of city services is one of the top goals of an open data initiative, making it easier to get the information they are already asking for may be a potential starting place.
- **Inviting nominations from citizens and other external stakeholders:** Getting the community excited about your open data efforts will be an important factor in their success. Making citizens, nonprofit organizations and the business community

part of the process by asking for their suggestions is a smart way to do that.

- **Hosting a hackathon to engage the local developer community:** As we mentioned earlier, more and more cities are inviting software developers to overnight hacking events where they put their brainpower to work using city data sets to create tools to improve their city's livability. You would need to release some data sets before you host a hackathon, of course. But if you already have ties to the developer community, soliciting their ideas on which sets to start with could be helpful.

It can also be useful to study what has proven successful in other cities. You saw many examples highlighted in Chapter 2. While mobile applications are a popular and relatively easy first project, since civic data is often spatial – meaning it has some location element – using data for online mapping is another option worth considering.

2. Choose your first project strategically

Obviously, you want your first project to be a big success. So once you have your laundry list of suggestions, you'll want to narrow it to projects you think will provide the biggest bang for the buck – solving an established citizen "pain point," for instance, or something that has proven wildly popular elsewhere.

Once you have your short list, prioritize projects based on the ones your team agrees will be most successful. Again, make sure your first project directly benefits citizens—better yet multiple stakeholders. You'll also want to be clear about what your objectives are and how you will measure the project's success.

When you've prioritized your short list and detailed performance metrics, circulate your plan to your sponsor and other key stakeholders for buy-in. When you've got approval, it's time to make things happen.

3. Develop a communications plan

Having a platform to share data is just one part of the equation; to be effective, you also need people to use it – both from your staff and the public. This effort begins with a solid communications plan that has several elements:

- It explains the open data mission and goals.
- It identifies working groups responsible for open data policy and implementation.
- It directs staff on how to help with the open data effort, and builds engagement by educating them about its benefits.
- It reinforces the mission through collecting and sharing open data success stories.
- It offers a clear path for making data sets available, and that path must be easy for the public to use.
- It makes the public aware of the availability of and uses for open data.
- It includes a feedback mechanism to identify issues, opportunities for improvement, and highly desirable data sets that aren't already available.

Promote an open data culture internally

Beyond providing the data, it's important to establish and maintain an open data culture. Employees are on the front lines with the users of the data, and your communications plan should set expectations and cultivate an open data environment with your staff.

Your communications plan should include briefings with key stakeholders as well as collaboration sessions between staff and leadership. Those sessions can be used to generate interest across departments, identify gaps, develop ideas to expand open data efforts and prioritize the preparation and release of data sets.

Reach out to the public

The largest open data user groups tend to be industry and academia. But because transparency is such an important goal, it's also important to reach out to the public at large when you promote your open data initiative. You may want to reach out specifically to groups that would be especially interested in a particular data set, while using your communication channels to also reach a broad audience.

In developing your external communication plan, make a list of your available communication channels and brainstorm how you could use them most effectively. As a starting point, consider these channels:

- Your website
- Your blogs
- Your Facebook, Twitter and other social media accounts
- YouTube and other video services
- Newspapers and broadcasters
- Community and industry bloggers
- University researchers

As we've mentioned, many communities are finding success by inviting programmers, developers and high-tech hobbyists to participate in hackathons – to see who can create an app or website with the biggest impact using open data.

Record your success

Beyond getting the word out, it's important to see how people make use of your open data sets. Your communication plan should include mechanisms for monitoring media coverage and data set usage. These real-world examples demonstrate the value and impact of your open data efforts and will help guide your future plans.

Communicate results

As you collect metrics on your open data initiatives, use your internal communication channels to share results with stakeholders and staff. This will help keep them engaged and inspire ideas for future projects.

As you collect open data success stories, use your internal communication channels to share them with stakeholders and staff. This is critical to keeping staff engaged in your open data efforts and for winning ongoing support from stakeholders.

Evaluate your open data project

To evaluate the success of your open data efforts, your communication plan should include tactics for receiving, evaluating and acting upon feedback. You want to understand what works, and what doesn't.

Occasionally, the feedback can come as a complete surprise to cities that believed they had thought of everything.

Consider Los Angeles, which was disappointed that very few of the developers participating in a hackathon used the city's open data in their projects. The city had made open data a priority. In talking to the participants after the event, the city quickly learned why: The open data was provided in a format that was very difficult to use. That experience helped shape improvements to its open data program.

Collect feedback

You don't need to stage large events to collect valuable feedback, however. You can gain useful insight through something as simple as a feedback form on your open data portal or by providing contact information for a public liaison.

Consider hosting a roundtable with members from your local developer community, industry, academia and the public. Your discussions will help you set a benchmark for your open data efforts, demonstrate the value of those efforts, determine what is working well, and identify opportunities for improvement and next steps.

Here are some key questions to ask:

- Are the data sets useful?
- Is the data provided quality data?
- How are you using the data?
- How could it be more useful?
- What data sets would you like to see?
- Are citizens getting what they want from government?

Consider next steps

As you evaluate the response, prioritize the feedback. You will want to deal with obstacles that slow or prevent the usage of the open data, as soon as possible.

Prioritize feedback

As you evaluate the feedback you receive from your open data initiatives you will want to as soon as possible address obstacles that slow or prevent the usage of the open data.

Next, look at the opportunities. Are you repeatedly getting requests for a particular data set that is not yet available? Make a list of those requests and prioritize them based on interest.

Are you hearing that certain features, APIs or data formats would make your open data more useful? Use that feedback as a starting point for your phase-two short list. Make sure to share that feedback with stakeholders to build support and secure funding for the next project.

And take the time to consider what worked well. Look at how the data is being used and the insights that resulted from it. Use those successes to develop best practices that will guide your future projects.

ADDITIONAL OPEN DATA RESOURCES

- **Big and Open Data in Europe: Growth Engine or Missed Opportunity?** This 116-page report examines the impact of big and open data on the economic and social aspects across the EU's 28 Member States by 2020.
- **Code for America Brigade** partners with dozens of cities and helps launch groups that hold regular civic hack nights and events; it also advocates for open data, and deploys apps.
- **Data.gov** is a U.S. government site offering data, tools and resources to conduct research, develop web and mobile applications, design data visualizations, and more.
- **Open Data Handbook: File Formats.** This section of the Open Data Handbook describes the common file formats used to make open data available. File formats are critical to discuss before beginning work on an open data project, as the format of the data can have dramatic effects on who can access the data and how easily it can be used.
- **Open Data Institute (ODI)** is a UK-based organization that enables people to learn and engage with open data via courses, lecture series and professional coaching and mentoring.
- **Public Value Assessment Tool (PVAT)** from Council advisor Center for Technology in Government provides a framework for governments to assess the public value of their open government initiatives.
- **Realizing the Promise of Big Data: Implementing Big Data Projects.** This document from Council member IBM provides a recommended step-by-step outline for planning, building support for, and implementing data projects. It also provides recommended actions to keep projects on track and on budget.
- **The DataTank.** The DataTank is open source software that governments can use to publish data sets online so the public can access and analyze them with a web-based API.
- **The Smart City: Using IT to Make Cities More Livable.** From Council member Microsoft, this white paper helps cities evaluate their IT infrastructure to determine if they're ready to undertake large data projects.
- **TWC International Open Government Dataset Search (IOGDS)** is a linked data application based on metadata "scraped" from hundreds of international data set catalog websites..
- **U.S. City and County Web Data API** is a U.S. Small Business Administration geographic names data set that provides a "mashup" of URLs for official city and county government websites and city and county location data.
- **World Bank Open Government Data Toolkit** provides a summary of the essential elements of open government data, including numerous links to open data resources.

APPENDIX

On the pages that follow, learn about the work of the Smart Cities Council and its partner companies and advisors who rank among the world's foremost experts on smart cities.

SmartCitiesCouncil
LIVABILITY | WORKABILITY | SUSTAINABILITY

About the Smart Cities Council

There is no other organization like the Smart Cities Council. We act as a market accelerator and advisor to cities – advocating for the transformation of urban areas into more livable, workable and sustainable communities. The Council is a coalition of leading technology companies with deep expertise in areas such as energy, water, communications and transportation. We have come together to provide a collaborative, vendor-neutral framework to guide cities through their smart city planning and implementation. We envision a world where technology and intelligent design are harnessed to create smart, sustainable and prosperous cities. We work to create cities that exemplify our three core values: livability, workability and sustainability. Visit www.smartcitiescouncil.com to learn more.

Global Alliances

In 2015 the Council introduced the Global Alliances of Smart Cities Councils – an opportunity for regional stakeholders everywhere to affiliate with the Council and leverage our best practices. The first licensee, Smart Cities Council India, launched soon thereafter. To discuss becoming a Global Alliance licensee, please contact Council Exectuive Director Philip Bane: Philip.Bane@smartcitiescouncil.com

Council Partners

On the pages that follow, you will meet our partners and advisors. We invite you to join with us too. Learn more by contacting Council Chairman Jesse Berst. Jesse.Berst@SmartCitiesCouncil.com

Smart Cities Council

INTRODUCING SMART CITIES COUNCIL LEAD PARTNERS

Cities seeking expert guidance regarding their smart city initiatives will discover valuable partners in the companies featured on the pages that follow.

IBM
Itron
Alstom
Microsoft
GE
Cisco
S&C Electric Co.
Bechtel
Qualcomm
MasterCard
Enel
Ooredoo
Daimler
Cubic Transportation Systems
Allied Telesis
Schneider Electric
Verizon

Partners are listed according to the date they joined the Council; longest-standing members appear first.

As a leading producer of smart technologies and services, IBM is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens.

Cities everywhere are reinventing themselves to better integrate across functions and collaborate with new partners to create and nurture the strong, differentiating identities that attract new citizens and businesses.

Combining world-class business, industry and technology expertise, IBM is able to apply innovation to help cities achieve their objectives. Drawing on thousands of client engagements across virtually every industry, only IBM offers the experience that today's challenges demand.

IBM smarter cities resources:

- *Smarter Cities press kit*
- *Smarter Cities web page*
- *White Paper: Smarter, More Competitive Cities*
- *People for Smarter Cities*
- *Smarter Cities You Tube Channel*

IBM worked with the city of Madrid to improve city life for three million citizens through a project that will use IBM's Smarter Cities technology to improve the efficiency of city services and provide citizens new tools to interact and communicate with the city council.

Leveraging big data and analytics, IBM helped Madrid transform its supplier management model by allowing the city to manage and pay each service provider based on the attainment of service levels. The platform integrates information provided by citizens with other data streaming in from sensors, devices, cameras, inspectors and suppliers as well as data from human resource management, job scheduling and geographic information systems to provide a comprehensive view of city services.

By helping Madrid manage an inventory of more than five million assets – ranging from park swings to traffic cameras – and the contracts of service suppliers, the project will deliver results for citizens by improving the management of public services such as street maintenance, lighting, irrigation, trees and green spaces and waste management.

"By enabling cities to better manage energy and water resources, Itron believes that, with collaboration and innovation, we can help cities not only adapt to address challenges, but also thrive. By drawing on today's best minds and technology, the Smart Cities Council and its members are committed to achieving just that."

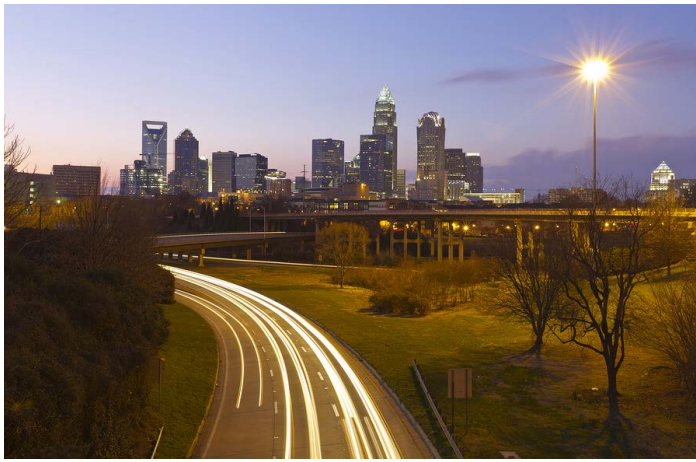
– Russ Vanos, Itron's senior vice president of strategy and business development

Itron is a world-leading technology and services company dedicated to the resourceful use of energy and water. We provide comprehensive solutions that measure, manage and analyze energy and water. Our broad product portfolio includes electricity, gas, water and thermal energy measurement devices and control technology; communications systems; software; as well as managed and consulting services. With thousands of employees supporting nearly 8,000 customers in more than 100 countries, Itron applies knowledge and technology to better manage energy and water resources. Together, we can create a more resourceful world. Join us: www.itron.com

As a founding member and lead partner in the Smart Cities Council, Itron is helping to advance Smart City initiatives at a time when it is critical to take action. We believe Smart City initiatives will be incredibly important in the 21st century. Currently, more than half of the world's population lives in towns and cities for the first time in history, which puts a strain on energy and water resources. In addition to the strain on resources, there is also an incredible amount of energy and water lost due to waste – approximately 30% of all treated water is lost and electricity losses cost utilities $24B per year. In order to ensure sustainability and viability of our cities for future generations, smart technology needs to be utilized to reduce waste and empower people to manage and conserve resources.

Itron is collaborating with Microsoft to provide actionable data to help cities meet their objectives to reduce their carbon footprint and lower energy consumption. Learn more >

Smart City innovation has turned Uptown Charlotte into a living laboratory. Envision Charlotte Executive Director Amy Aussieker shares insights about the project. Learn more >



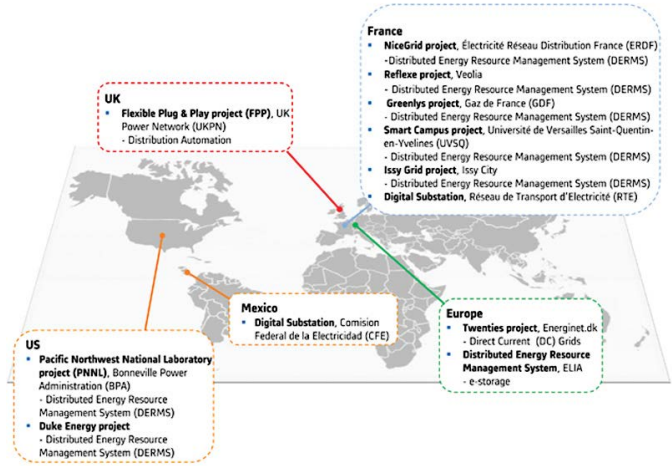
Envision Charlotte: Itron teams up with partners to connect consumers with water usage and conservation information.

Read article >

Itron's water AMI solution helps the City of Kalgoorlie, Australia to manage resources more effectively and provide greater control over water wastage. Learn more >

Itron's Mobile AMR solution allowed Alabama Gas Corporation to reduce CO2 emissions with fewer vehicles while gaining greater meter reading efficiency. Learn more >

Alstom developed a number of demonstration projects in leading smart grid countries, in partnership with governments, utilities, industries, academic and research institutions.



As a leading producer of smart technologies and services, Alstom Grid is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens.

To meet today's increasing global energy demands and challenges, networks must evolve and become smarter. Alstom Grid enables an efficient transmission and distribution of electricity and supports the development of Smart Grids and Supergrids with engineered solutions for applications in utility and industry settings; updating existing grids, integrating and customizing solutions such as alternating current and direct current substations, from medium up to ultra-high voltages. Alstom Grid is a key player in developing and implementing solutions to manage electric grids in the new era of increasing renewable energies and distributed energy resources, by enabling real-time, two-way management of electricity and information.

At the heart of the Smart Grid revolution, its solutions provide immediate benefits in many eco-city projects, thus enabling end-consumers to benefit from better energy consumption. Alstom Grid's knowhow is displayed in over 30 large scale demonstration projects in the US and Europe, with partners from both the public and private sectors.

The North Carolina Smart Grid Project in the USA led by the US Department of Energy (DoE) is designed to integrate distributed energy resources into the electrical grid efficiently in order to help the DoE reach its smart grid targets for 2030, including a 40% improvement in system efficiency. The NiceGrid smart district project developed with the French Distribution System Operator ERDF, located in the city of Nice (French Riviera), aims at developing several microgrids with integrated renewable energy sources and electricity storage with a scalable and cloud-based IT platform.

Clean grid

Learn more >

Global grid

Learn more >

Smart grid

Learn more >

Electrical network systems

Learn more >

Video overview

See video >

Microsoft

Founded in 1975, Microsoft is the worldwide leader in software, services, devices and solutions that help people and businesses realize their full potential. Microsoft CityNext is an extension of that vision with a people-first approach to innovation that empowers government, businesses and citizens to shape the future of their city. People-first means harnessing all the ideas, energy and expertise of a city's people as it creates a more digital, healthy, educated, safe, and sustainable place to live.

With a broad suite of platform and productivity solutions for a mobile-first, cloud-first world, a vast global network of partners, and a history of successful education and social programs, Microsoft CityNext helps cities find the right answers for their local challenges and opportunities.

With Microsoft CityNext's partners, we are committed to helping cities:

- **Transform operations and infrastructure** with Microsoft CityNext and our partners' solutions by connecting systems, data, and people across departments to make information more accessible and services more affordable

- **Engage citizens and businesses** by enabling real-time communication services through devices and apps to provide additional value to citizen services, reach a broader population of citizens, and engage citizens and businesses more deeply with intelligent experiences. This includes connections between governments and citizens, governments and businesses, and other governments.

- **Accelerate innovation and opportunity** through programs that prepare youth to become the next generation of highly skilled workers, nurture entrepreneurs' bold ideas, and create jobs that help cities compete in the global marketplace by delivering excellent education, use data from the Internet of Things to develop new services and businesses, and attract talent and new business with a modern infrastructure.

Through a people-first approach and strategic partnerships, cities can enable sustainable cycles of innovation, opportunity, and progress for years to come.

Find out how Microsoft CityNext and our partners are enabling cities worldwide to harness the new era of innovation.
Learn more ->

Microsoft CityNext helps city leaders turn their smart city vision into reality.
Learn more ->

Connect with us on Twitter, Facebook, and YouTube to receive updates on new customer stories, partners, and more.

Learn more about how Microsoft CityNext and our partners are helping cities become smart with a people-first approach at http://microsoft.com/citynext

Imagine a world that connects data to people to machines, making lives better in the cities where people work, live and explore. It's a world where city leaders could tap into endless intelligence to eliminate costly redundancies and develop a more workable and livable community.

That world is here, and it's powered by Predix™ , GE's cloud platform for the Industrial Internet. Through GE's Intelligent Environments for Cities solution, communities around the world will experience pioneering solutions from such businesses as GE Software, GE Lighting, GE Healthcare and GE Power & Water. At GE, we look at innovation through a broad lens. By taking breakthroughs in one business and applying them to others, we push expectations and change the idea of what's possible – all for the benefit of cities around the globe.

GE Software is bringing the Industrial Internet to life by connecting minds and machines through innovative technology. In building our applications and GE Predix, we combine decades of experience manufacturing industrial machines with cutting-edge data science and analytics expertise. The Predix platform has helped our developers save both GE and our customers time, energy and money, and now we are releasing it so that your developers can leverage its advanced computing power and built-in integrations to develop innovative applications across industries. We have transformed our business and invite you to join us on this path as we ignite the next Industrial Revolution together. Learn more at gesoftware.com and predix.io.

Seeing More than Light

One of GE's Intelligent Environments for Cities solutions uses LED street lighting and wireless sensors to connect, collect and analyze data, harnessing the power of the Industrial Internet to solve countless challenges facing cities and communities across the globe.

Cities on both U.S. coasts are piloting the Intelligent Cities technology to help solve these challenges and enhance the quality of life for residents and visitors. In San Diego, California, sensor technology has been added to existing GE LED streetlights, with a focus on parking solutions in its urban core. The city of Jacksonville, Florida is piloting the solution to access real-time data and focus on increasing efficiency through energy savings and better asset management of street lights.

From curbing street-lighting costs to improving traffic monitoring, enhancing pedestrian crosswalk detection, mitigating illegal dumping and monitoring adverse weather conditions, the potential solutions from this technology are endless. Learn more about the pilot programs.

> *GE works on things that matter. The best people and the best technologies taking on the toughest challenges. Finding solutions in energy, health and home, transportation and finance.*

GE supports the Smart Cities Council's vision to transform urban areas into more livable, workable and sustainable communities. As a technology company, sustainability is embedded in GE's culture and business strategy. Working to solve some of the world's biggest challenges inspires our thinking and drives our actions.

Visit www.ge.com to learn more.

As world populations shift to urban areas, community leaders are pressed for answers to related problems. These include over-crowding, pollution, budget and resource constraints, inadequate infrastructures and the need for continuing growth.

Cisco Smart+Connected Communities solutions use intelligent networking capabilities to bring together people, services, community assets and information to help community leaders address these world challenges. By connecting the unconnected, we can do amazing things to address these real world challenges and create a more sustainable environment.

Cisco Smart+Connected Communities -- help transform physical communities to connected communities and achieve economic, social and environmental sustainability.

Transforming communities >

Retrofitting existing cities with smart solutions is the urban challenge of the 21st century.

Learn more >

City transforms economic sustainability with public cloud.

S&C ELECTRIC COMPANY

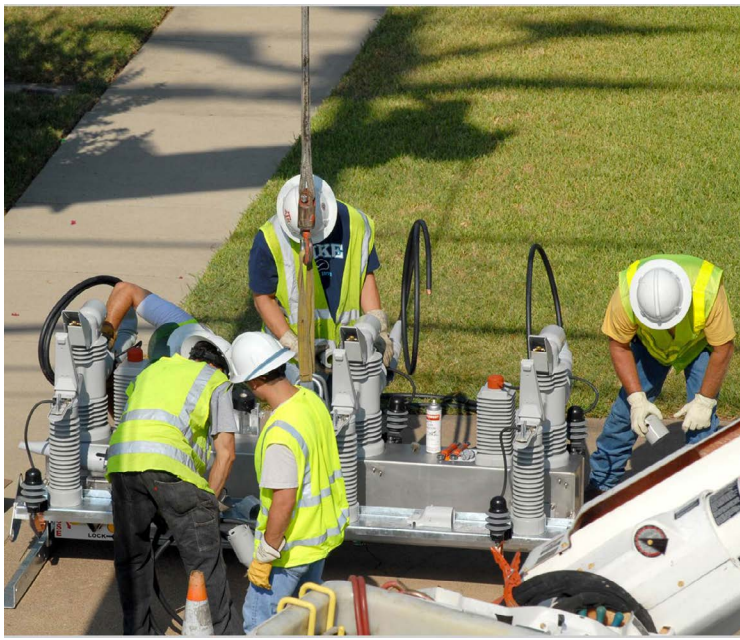
Excellence Through Innovation

S&C proudly supports the Smart Cities Council in advocating the evolution toward smart, sustainable cities.

S&C Electric Company's innovative solutions for distribution automation and power delivery are helping cities around the world transition to cleaner and more reliable supplies of electricity required in the 21st century. S&C's groundbreaking technologies can reduce the length and frequency of power outages, improve energy efficiency, support advanced microgrids and grid-scale energy storage, and make it practical to use such variable renewable-energy sources as wind and solar power on a larger scale.

With its unmatched heritage of innovation and performance, S&C delivers both products and services to address not only today's power grid challenges, but tomorrow's as well.

Additional information is available at sandc.com.



Chattanooga, USA deployed S&C's self-healing smart grid solution to improve power reliability. The system is exceeding outage reduction goals of 40%.

Additional resources:

- **Reducing Momentary Outages for Florida Power & Light:** *Press release* *Video*
- **S&C Ties California Utility's 2-MW Solar PV Project to the Grid:** *Case study*
- **Oncor's Microgrid Solves Electrical Distribution Challenges:** *Video*
- **Energy Storage to Smooth Solar Power:** *Case study*
- **Utility-Scale Energy Storage System Islands Remote Town During Outages:** *Video* *Case study*
- **Improving Reliability by more than 50% with Self-Healing Technology:** *Case study*
- **What do outages cost cities?** *Video*
- **Microgrids: An Old Idea with New Potential:** *White paper*
- **The Role of Energy Storage in Smart Microgrids:** *White paper*
- **Smart Microgrid at Illinois Institute of Technology:** *Case study*

Bechtel is pleased to support the Smart Cities Council's aspirations to foster the creation of smarter cities around the world by sharing our experience delivering major infrastructure projects and knowledge of planning, financing and sustainable solutions.

As a company, we work hard to build a more sustainable world. In our work with cities and governments we enhance local communities and improve the quality of life for people around the world. Time and again our work has demonstrated that the only limits on human achievement are those that we place on ourselves.

Bechtel is a global leader in engineering, procurement, construction and project management. Bechtel's diverse portfolio encompasses energy, transportation, communications, mining, oil and gas and government services.

We have been privileged to contribute towards some of the most significant urban infrastructure projects around the world, including the Channel Tunnel, Hong Kong International Airport, the Athens Metro system and work on more than 20 new cities and communities. In order to deliver projects of such magnitude successfully, we combine smart planning, technical know-how and an integrated approach to make visions become a reality. We look forward to sharing the benefits of this experience and our knowledge of planning, financing and sustainable solutions, to support the Council's aspirations to foster the creation of smarter cities around the world.

Since its founding in 1898, Bechtel has worked on more than 22,000 projects in 140 countries on all seven continents. Today, our 53,000 employees team with customers, partners and suppliers on diverse projects in nearly 50 countries. We stand apart for our ability to get the job done right - no matter how big, how complex or how remote. www.bechtel.com

Bechtel is the co-manager of the U.S. Department of Energy's Los Alamos National Laboratory. The lab provides advanced research in supercomputing and virtual reality with significant applications to Smart City issues such as energy, transportation, the environment and resilience.

For local, state and federal government personnel, good situational awareness can help save lives and better protect assets.

Qualcomm Incorporated is the world leader in 3G, 4G and next-generation wireless technologies. Qualcomm Incorporated includes Qualcomm's licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm's engineering, research and development functions, and substantially all of its products and services businesses, including its semiconductor business, QCT. For more than 25 years, Qualcomm ideas and inventions have driven the evolution of digital communications, linking people everywhere more closely to information, entertainment and each other. Qualcomm innovation and technology can be used by cities worldwide to provide smart, efficient and sustainable services, including:

Cellular Grid Connectivity – ubiquitous consumer coverage, high bandwidth and real-time communications of 3G and LTE cellular networks that enable critical smart grid functionality such as advanced smart metering, demand response, distribution automation, and outage management.

Home Area Connectivity – unsurpassed whole home coverage, performance and reliability in an energy efficient manner.

Connected Vehicle – anywhere/anytime emergency assistance services, remote monitoring and diagnostics, advanced driver assistance features, GPS and GLONASS-enabled position-location features and services.

Wireless Electric Vehicle Charging – a simple, no fuss way to charge your electric vehicle. No cables, no wires, just park and charge.

Mobile and Wireless Health – broadband technologies enabling mHealth devices and services for chronic disease management, remote patient monitoring, diagnostic care, as well as products associated with general health, wellness, fitness, and aging.

Mobile Learning – mobile broadband technologies enabling personalized experiences within collaborative communities, transforming the work of teachers/students in K-20 schooling.

Qualcomm leverages its wireless expertise, innovative technologies and vast industry reach to provide capabilities and services that enable government customers – federal, state, and local.

Learn more >

Smart cities

Learn more >

Internet of Everything

Learn more >

Wireless technologies

Learn more >

MasterCard shares the Smart Cities Council's vision of a world where digital technologies and intelligent design are harnessed to create smart, sustainable cities with high-quality living and high-quality jobs.

MasterCard is a global payments and technology company. We operate the world's fastest payments processing network, connecting consumers, financial institutions, merchants, governments, cities and businesses in more than 210 countries and territories.

Our products and solutions are advancing the way consumer and business cardholders around the world shop, dine, travel, and manage their money, enabling transactions that drive global commerce and improve peoples' lives.

Passionate about innovation, MasterCard is constantly seeking to develop and test new payment channels and digital solutions that are safe, simple and smart.

Payments touch every aspect of our lives. Removing cash from the economy creates far-reaching and cumulative benefits for all participants — citizens, merchants, tourists and government —improving life for the city at-large.

Cities are becoming smarter, and whether it is to simplify internal processes, facilitate micro payments (transit, commerce...), optimize collection of funds or improve disbursement methods, MasterCard is developing inventive ways to support Cities digital strategy, drive local business growth, fuel commercial development, increase citizen's satisfaction and reduce costs.

Special and Unique Offers with MasterCard Priceless Cities. www.priceless.com

London bus passengers speed up their journey times with contactless card payments.

London bus cards >

The global journey from cash to cashless: boosting economic growth and advancing financial inclusion.

Learn more >

Digital sharing and trust project: understanding the five online personas.

Learn more >

Enel is a multi-national power company and a leading integrated player in the world's power and gas markets, with a particular focus on Europe and Latin America. The Group operates in over 30 countries across four continents, generating power from over 90 GW of net installed capacity and distributing electricity and gas through a network spanning around 1.9 million km. Enel, with its 61 million end users worldwide, has the largest customer base among its European peers and is among the leading power companies in Europe in terms of installed capacity and reported EBITDA.

Enel was the first utility in the world to replace the traditional electromechanical meters with smart meters, making it possible to measure consumption in real time and manage contractual relationships remotely. Today, around 32 million Italian retail customers are equipped with smart meters developed and installed by Enel. The Group is deploying an additional 13 million smart meters to its customer base in Spain as well as running pilot tests for the smart cities of Búzios (Brazil) and Santiago (Chile). This innovative tool is key to the development of smart grids, smart cities and electric mobility.

Enel is strongly committed to renewable energy sources and to the research and development of new environmentally friendly technologies. Enel Green Power (EGP) is the Group's publicly listed renewable energy generation company, operating over 9.8 GW of net installed capacity of hydro, wind, geothermal, solar, biomass and co-generation sources in Europe, the Americas and Africa. Enel Green Power is, technology-wise, the most diversified renewable company among its global peers.

Enel website >

Enel on sustainability >

Enel on innovation >

> *Strongly committed to renewable energy sources.*

Headquartered in Doha, Ooredoo is Qatar's leading communications company and is dedicated to supporting the Qatar National Vision 2030.

Ooredoo has an active strategic and supportive role in shaping the telecom and ICT strategies in Qatar as part of its goal to make the country one of the best-connected nations in the world. The "smart city" concept is central to the long-term development vision of Qatar, placing technology at the heart of new projects to enable a smart economy, smart mobility, a cleaner environment and smart governance.

To support this vision, Ooredoo has developed and launched a host of next generation technology from smart infrastructure (4G+ and Fibre), smart entertainment, connected cars, next-generation education, health and workplace solutions, intelligent transport and smart stadiums, demonstrating the company's leadership in driving the latest and the best technology.

Ooredoo is spearheading this technological boost by working with a number of leading enterprises including KT Corporation of Korea and Lusail Real Estate Development Company, to ensure the development of smart city technology.

Ooredoo is a leading communications company providing services in the Middle East, North Africa and Southeast Asia.

Ooredoo is becoming a leader in the provision of the network infrastructure required to build the Smart Cities of the future, and is leading the efforts for the first-ever Smart City in Qatar – the state-of-the-art Lusail City – which will be supported by Ooredoo's faster and bigger network. Residents and businesses will have access to a variety of smart services powered by a citywide Ooredoo Fibre network and managed through a centralised control centre.

The company has introduced a host of cutting-edge Ooredoo Machine to Machine (M2M) services to Qatar, enabling companies to connect business assets directly with each other or with a central command centre, removing the need for human involvement, and introducing new solutions directly into homes and businesses.

Ooredoo has also launched The Smart Living-Baytcom Project – a 'Proof of Concept Demo House' filled with smart living concepts.

Ooredoo website >

DAIMLER

About Daimler AG:

Daimler AG is one of the world's most successful automotive companies. With its divisions Mercedes-Benz Cars, Daimler Trucks, Mercedes-Benz Vans, Daimler Buses and Daimler Financial Services, the Daimler Group is one of the biggest producers of premium cars and the world's biggest manufacturer of commercial vehicles with a global reach. Daimler Financial Services provides financing, leasing, fleet management, insurance and innovative mobility services.

The company's founders, Gottlieb Daimler and Carl Benz, made history with the invention of the automobile in the year 1886. As a pioneer of automotive engineering, we continue to shape the future of mobility today: Our focus is on innovative and green technologies as well as on safe and superior automobiles that appeal to and fascinate our customers. For many years now, Daimler has been investing continually in the development of alternative drive systems with the goal of making emission-free driving possible in the long term. So in addition to vehicles with hybrid drive, we now have the broadest range of locally emission-free electric vehicles powered by batteries and fuel cells. This is just one example of how we willingly accept the challenge of meeting our responsibility towards society and the environment.

> *As a pioneer of automotive engineering, we continue to shape the future of mobility today.*

Daimler sells its vehicles and services in nearly all the countries of the world and has production facilities on five continents. Its current brand portfolio includes, in addition to the world's most valuable premium automotive brand, Mercedes-Benz, the brands smart, Freightliner, Western Star, BharatBenz, Fuso, Setra, Thomas Built Buses, moovel and car2go. The company is listed on the stock exchanges of Frankfurt and Stuttgart (stock exchange symbol DAI). In 2014, the Group sold 2.5 million vehicles and employed a workforce of 279,972 people; revenue totaled €129.9 billion and EBIT amounted to €10.8 billion.

About Business Innovation:

Since 2007 the Business Innovation department has been Daimler's lab for innovative business ideas that reach out well beyond the company's core business of automotive manufacturing. Business Innovation tracks current trends and monitors technological, social and cultural developments with a view to developing new and profitable business solutions. Numerous pilot projects initiated in recent years have already led to the establishment of successful corporate units such as car2go, moovel or the Mercedes-Benz Driving Academy. There are now Business Innovation teams based all over the world. As well as at the headquarters office in Stuttgart, they are to be to be found in Istanbul, São Paulo, Beijing, Buenos Aires and Sunnyvale, California.

Cities around the world are facing the growing problem of aging and overburdened infrastructure, needing to carry more people but without the ability to move those people effectively. What's the answer? Cubic is doing this through NextCity, our vision for the future of urban mobility.

At Cubic, we love to solve problems and help travelers pay their fares quickly and safely through the revenue management and Intelligent Transport Systems (ITS) systems and tools we deliver to choose the smartest and easiest way to travel and pay for their journeys.

We also enable transportation authorities and agencies to manage demand across the entire transportation network – all in real time.

Today, all of our payment and information technology and services have been merged into an overarching vision called NextCity. Through NextCity and its subsystems, we are able to extract the data from our electronic payment systems and other system sensors. This data becomes actionable information for transportation operators to understand what their ridership is doing – where they come from, where they go, the routes they take and the times at which they travel. Better understanding of demand allows for better understanding of supply and capacity needs.

This data also empowers the travelers with information they can use to choose the best mode of travel as well as to know what and where the slowdowns or service alerts are to aid their journey planning.

Transport for London in partnership with Cubic is transforming the payment experience in one of the world's biggest cities. Learn more >

NextCity takes us further than we've ever been before. Learn more >

Innovative solutions for intelligent travel.

Allied Telesis maintains a long history of helping cities implement their visions of interconnected, smarter operations on a city-wide basis.

Using the Company's resilient switching products and sophisticated network monitoring services, cities around the world have deployed IP video cameras, and made hospitals and homes smarter and more livable. Allied Telesis wireless solutions allow cell-based or blanket technologies to cover anything from small businesses to large venues with exceptional bandwidth and service.

Smarter solutions for a smarter planet.

We are at the start of a revolution with Smart Gigabit Cities around the globe. Cities that enable people to communicate at gigabit speeds on wireless and wireline networks are well positioned to attract the best and brightest business leaders, while enabling economic prosperity. The Internet of Things (IoT) and Smart Gigabit Cities are synonymous, and represent key aspects of any city revitalization process.

Smart Gigabit Cities deploying integrated safety solutions from Allied Telesis are able to protect and serve their communities by integrating a plethora of sensor types, providing a geospatial representation of their installed area, and taking the operations of a municipality to a new level of efficiency and safety. Using Allied Telesis EtherGRID solutions, city planners can fully integrate historical data about operations in their cities with sensor inputs, give a real-time view of current events, and utilize advanced spatial analytics. These capabilities provide planners and city managers the tools needed to elevate planning and decision-making to a new level of effectiveness.

Allied Telesis website
Learn more >

Communications solutions
Learn more >

Education solutions
Learn more >

Healthcare solutions
Learn more >

Transportation solutions
Learn more >

As a leading provider of smart city solutions and services, Schneider Electric is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners, and citizens.

A global specialist in energy management with operations in more than 100 countries, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in Utilities & Infrastructures, Industries & Machine Manufacturers, Non-residential Buildings, Data Centres & Networks and the Residential sector. The group is focused on making energy safe, reliable, efficient, productive and green, through an active commitment to helping individuals and organisations make the most of their energy.

Schneider Electric delivers urban efficiency. The group is a trusted partner in cities around the world and works collaboratively with visionary city leadership, engaged stakeholders, and a dynamic network of partners to address each city's unique challenges. With solution and services expertise in the critical infrastructure areas of energy, buildings, water, transportation, public services and integration, Schneider Electric is able to effectively bridge traditional information silos. The group's innovative solutions and pragmatic integration capabilities combine both operational and information technology, for impactful implementations that deliver the short-term, visible, maximum return on investment results that cities need.

Learn more about Schneider Electric's smart city solutions.

Schneider Electric helps to advance a smart city at the foot of the Sierra Nevada mountains

Learn more >

German city consolidates building management and cuts energy use with Schneider Electric solutions

Learn more >

White papers:

- *Urban Mobility in the Smart City Age*
- *The Smart City Cornerstone: Urban Efficiency*

Verizon's Smart Cities solutions empower municipalities to solve some of today's biggest challenges -- including public safety, traffic and energy management, intelligent transportation and precision agriculture -- using a powerful combination of advanced networking, cloud computing, security and device management. By making cities "smarter," local governments, in collaboration with Verizon, are able to become more efficient, resilient, address aging infrastructure, generate more revenue and better protect the local communities they serve.

Verizon's Smart Cities solutions help municipalities quickly and cost-effectively support initiatives for managing buildings, roadways, utilities and transportation systems. Using applications such as fleet and asset management, smart lighting, condition-based maintenance and smart grid technology -- enabled by Verizon's network and cloud infrastructure -- Verizon helps city planners develop sustainable platforms to use resources more efficiently. The goal is to help generate non-tax city revenue, create safer municipalities, engage constituents and promote urban renewal -- all of which can attract businesses, residents and workers.

Verizon smart cities and Internet of Things resources:

- *News article: Verizon Accelerates Move to Smart and Sustainable Cities:*
- *Video: Verizon on Smart Cities*
- *Webinar replay: "The Art of Smart Cities"*
- *Case study: Building Smarter and Safer Communities*
- *Case study: Helping the City of Charlotte Envision a More Sustainable Future*
- *Case study: City of Napa Improves Visibility and Efficiency with Networkfleet*
- *Infographic: Moving to a Smarter City*
- *News article: Verizon Delivers Smart Energy As-A-Service*
- *News article: The Future of Smart Grid Technology*

On the Verizon website:

- *Verizon Smart Cities Solutions*
    - *Solutions for State & Local Government*
    - *Solutions for Public Safety Services*
- *Verizon Grid Wide Utility Solutions*

Smart Cities Council

INTRODUCING SMART CITIES COUNCIL ASSOCIATE PARTNERS

Council Associate Partners are leaders in their sectors. Learn more about them on the pages that follow.

ABB
Alphinat
SunGard Public Sector
CH2M
Imex Systems
Neptune Technology Group
Siemens
Enevo
OSIsoft
Saudi Telecomm
Black & Veatch
Organic Energy Corp.
Urban Integrated, Inc.
Space-Time Insight
Elster
Bit Stew Systems
Silver Spring Networks
Civic Resource Group International
Badger Meter
Entrigna
Apex CoVantage
Veolia
Intel
West Monroe Partners
Spire Metering
TROVE
K2 Geospatial
Clevest

Partners are listed according to the date they joined the Council; longest-standing members appear first.

ABB strongly supports the Smart Cities Council's goals of livability, workability and sustainability"

"Cities today are home to over 50 percent of the world's population and account for 80 percent of global GDP. By 2050, an additional 2.9 billion people will be living in cities, and urban dwellers will represent 70 percent of the world's population. About 90 percent of this growth will be in developing economies as people are drawn to urban areas by the perceived economic advantages. These cities will need new and intelligent infrastructure to meet the needs of their citizens and businesses.

Other cities that are not facing dramatic population increases are setting goals to ensure their long-term prosperity. With businesses and workforce becoming increasingly mobile, they are shaping their futures around competitiveness, liveability and sustainability.

An effective way to support these city goals is by using technology to more intelligently monitor, optimize and control key systems and infrastructure. In other words, to operate as a 'smart city'.

Many intelligent power and automation solutions already exist to enable cities to automate their key public and industrial services in the areas of:

- City Communication Platforms
- Electricity Grids
- Water Networks
- Transport
- Buildings
- District Heating and Cooling

ABB's heritage in power and automation is one of continued innovation and delivery on behalf of our customers, spanning over 125 years. Our products and solutions are at the heart of a city's critical infrastructure, relied upon for everything from the supply of power, water and heat, to the automation of factories and the buildings we live and work in."

ABB Smart Cities portal: *Smart Cities >*

ABB Smart Grids portal: *Smart Grids >*

As a leading producer of smart technologies and services, Alphinat is pleased to contribute to the Smart Cities Council Readiness Guide and other materials to help accelerate the move to smart, sustainable cities.

Alphinat is a software editor of SmartGuide® the leading "one stop" Web, Mobile and Cloud Solution Development Platform that enable cities to easily create, deploy and manage intelligent personalized web applications.

With our partners we are looking to give client cities constituents a simpler user experience that can, guide them to an optimal experience in a mobile or traditional browser-based environment. SmartGuide provides organizations and other software editors with the agility to quickly deliver efficient online services to their stakeholders unleashing the full value of existing IT assets. An Alphinat partner is delivering intelligent e-services for municipalities in the Netherlands in SaaS and on-premises modes incorporating SmartGuide® into their suite giving municipal clients the ability to quickly deploy intelligent online services. Citizens no longer need to fill in data already known to the government. Furthermore, these online services are accessible on Smartphone or tablets.

SmartGuide allows municipalities to deliver e-services with personalized, real time data exchange. With these intelligent e-services, municipalities greatly enhance the quality of their online service delivery and increase citizen satisfaction. The e-services offered automatically determine whether a citizen is entitled to a particular service such as a tax refund or a parking permit. These complex real-time validations delivered by the digital service bureau result in tremendous time savings for citizens and the community.

Alphinat technology can benefit city of all sizes by helping them modernize, automate and render cost-effective a many business processes at a fraction of the cost associated with conventional customized solutions. Alphinat is headquartered in Montreal, Quebec, with offices in Paris, New York and Zurich.

For more information, visit:

- **Alphinat website >**
- **Alphinate DGME case study >**

SUNGARD® PUBLIC SECTOR

SunGard Public Sector is a leading provider of software and services for local governments, public safety and justice agencies and nonprofits. More than 150 million citizens in North America live in municipalities that rely on our products and services.

For more than 30 years, SunGard Public Sector has leveraged ground-breaking technology and our innate understanding of the needs of the public sector toward the development of public administration and public safety software. SunGard Public Sector's products enable our customers to experience the future happening today. Visit us online at www.sungardps.com.

SunGard Public Sector's software products not only enhance the way municipalities, public safety and justice agencies, and nonprofits conduct business – they redefine the way citizens and employees interact with government.

The City of Oviedo, Florida has been a SunGard Public Sector customer since 1995. In 2004, the city switched its implementation to SunGard Public Sector's Horizon Government Cloud, a powerful resource for local governments seeking to do more with less. Prior to switching to Horizon, the City of Oviedo found the cost of equipment, expertise and time to maintain their existing premise-based computer system challenging. When financial resources became limited, the city began seeking alternative solutions. The switch to Horizon has ultimately helped Oviedo become smarter with the way they do business. Read more >

Located just a few miles northeast of Atlanta, Johns Creek, Georgia can go an entire winter without seeing snow. But that changed in January 2014, when the entire Atlanta area was rattled by ice storms and heavy snow. To keep residents of Johns Creek apprised of the situation, the local police department started centrally distributing information through its Facebook and Twitter accounts on a regular basis. Johns Creek Police Department is a customer of SunGard Public Sector and a user of SunGard Converge Police-to-Citizen (P2C), which allows the department to share public information with citizens in a central way and lets citizens search police records and download reports. The proprietary P2C system, called JCPD4Me, is interoperable with social media platforms like Twitter and Facebook, which means that citizens can get this information and interact with the police department through the platforms they already know. Read more >

ch2m SM

At CH2M, we naturally take pride in the projects we deliver, but we never forget what our work is really about: clean water to drink, affordable energy, sustainable cities for families now and in the future, more closely connected communities and so much more. Every project we take on is a chance to move the world forward one more step, and we think that's an incredible privilege.

We're excited by tough challenges — the tougher they are, the more excited we get. We love to take on our clients' most complex infrastructure and natural resource problems, turning them upside down and inside out, solving them in ways nobody has thought of before. Together, we create new pathways for human progress, breathing fresh life, energy and enterprise into every community we touch.

Our partners and clients include governments, cities and businesses in more than 50 countries. To meet their biggest engineering challenges, we tap deeply integrated capabilities across our organization — in transportation, water, environmental, nuclear, oil & gas, industrial and urban environments. And we draw on the exceptional skills and creativity of 25,000 teammates with an outstanding track record of expertly executing projects both big and small.

We love what we do, but we care just as much about how we work. Deep respect for our family of employees, our clients and the communities we serve guides us at every step. We aim to meet each day with integrity, an adventurous spirit, and dedication to the well-being of people in our lives and work.

Read all about some of our projects in these sectors:

- **Energy >**
- **Transit & Rail >**
- **Water >**

Imex Systems helps build the next generation of smart hovernments and smart cities that are livable, workable, sustainable and prosperous. Imex Systems integrates city government, city infrastructure and citizens to create a smart city that improves the quality of life for citizens, enhances economic development, and fosters sustainability.

Our iGov technology platform and services enable governments to provide "Any Time, Any Where, Any Device and Any Channel" convenience for citizens to access government services, while helping governments automate and optimize business processes to improve internal operations. iGov helps measure and manage performance, find bottlenecks, and continuously improve service delivery to reduce costs. Other benefits include:

- Leveraging common re-usable technology components to reduce costs of smart city implementation and maintenance.
- Breaking down departmental silos to create a centralized collaborative approach.
- Increased engagement with citizens through web and social media channels.
- Proactively communicating with citizens during emergency situations through multiple channels.
- Integrating infrastructure – water/sewage, waste, power, tansportations and buildings for smart operations.
- Providing transparency through open data.
- Enhancing financial and digital inclusion.
- Reducing governments' carbon footprint.

The miGov mobile service delivery platform puts the government at citizens' finger¬tips by providing real-time messaging and service delivery. Governments can communicate instantly and effectively with their citizens on a wide range of topics, from a change in service, to an emergency situation.

Our payment systems help governments manage their revenue using a variety of payment methods and technologies, from traditional cash transactions to cutting-edge mobile payments. We offer pre-paid credit cards to efficiently manage benefit payments while reducing costs, and providing greater citizen convenience.

Our on-premise and cloud solutions are affordable for small towns and scalable, to meet the needs of large governments in both emerging and advanced markets.

Visit our website at www.imexsystems.com to learn more about our products, solutions and services.

Neptune Technology Group Inc. is a pioneer in the development of automatic meter reading (AMR) and advanced metering infrastructure (AMI) technologies for more than 47 years.

Neptune has continually focused on the evolving needs of utilities – revenue optimization, operational efficiencies and improved customer service. The company offers a fully integrated migration path for its utility customers to meet their needs now and in the future.

Each utility has its own unique needs, based on size, geography, infrastructure and other factors. Neptune makes it a point to understand your specific needs so that we can offer a solution that suits you the best. That's how we strive to become your ***most valued partner.***

Once we understand the challenges that your utility is facing, our people are trained to help you determine the best meter reading systems and tools that can be used to meet those needs, maximizing accuracy and efficiency while reducing costs and labor. And while providing for your present needs, Neptune helps utilities to always keep an eye toward the future not only with advanced technology but also with systems that allow for easy migration to adapt to changing requirements.

At Neptune, we have a rich history of innovation in meter reading systems on which we continue to build.

See/read about how Neptune is helping water utilities keep an eye on the future:

- Indio Water Authority General Manager, Brian Macy, uses Neptune's R900 System to help reduce Non-Revenue Water
- Neptune Territory Manager, Andy Bohn, helped Indio Water Authority share data through all their department
- Read more about Indio as well as other case studies

Learn more at: https://www.neptunetg.com

SIEMENS

The megatrends urbanization, climate change, globalization and demographic change will shape the future of cities. With the need to improve the quality of life and economic competitiveness, cities have to become more resource-efficient and environmentally friendly.

Technologies are major levers and base for further sustainable city development. An effective infrastructure contributes to economic prosperity, improving quality of live. Urban residents need clean air, potable water as well as security. They need efficient buildings, a reliable power grid and capable mobility solutions.

The complexity involved requires a holistic view and sustainable solutions for cities. Siemens has the portfolio, know-how and consulting expertise to make cities more livable, competitive and sustainable.

Infrastructure is the backbone of our economy. It moves people and goods, it powers our lives, it fuels growth. Across the world, more and more people are struggling with systems that are aging or overwhelmed. Siemens offerings include:

- Total integrated power solutions for safe, reliable, efficient power distribution
- Smart grid technologies that balance supply and demand, prevent power outages and integrate renewable power cost-effectively
- Integrated mobility solutions that move people and goods faster, safer and with fewer resources
- Smart building technologies that drive energy efficiency, reduce costs, and protect and secure all assets

Siemens website >

Infrastructure & Cities Sector >

enevo

Enevo is pleased to support the Smart Cities Council and contribute to its Readiness Guide.

Enevo brings together software and telecommunication engineers, data analysts, network gurus and seasoned waste management experts to create smart logistics optimizations solutions for the waste management and recycling industry. We help both commercial waste management companies and public organizations to operate more resource efficiently.

Until now collecting waste has been done using static routes and schedules where containers are collected every day or every week regardless if they are full or not. Our flagship solution Enevo ONe changes all this by using smart wireless sensors to gather fill-level data from waste containers. The service then automatically generates schedules and optimised routes which take into account an extensive set of parameters (future fill-level projections, truck availability, traffic information, road restrictions etc.). New schedules and routes are planned not only looking at the current situation, but considering the future outlook as well.

Collection based on Enevo's smart plans significantly reduces:

- Costs
- Emissions
- Road wear
- Vehicle wear
- Noise pollution
- Work hours

Enevo ONe provides organizations up to 50% in direct cost savings in waste logistics. And that's not all. Reducing the amount of overfull containers means less litter and happier customers! Enevo ONe provides a significant increase in efficiency across the whole value chain.

Visit the Enevo website >

Learn more about Enevo ONe >

OSIsoft provides an open infrastructure to connect sensor-based data, operations and people to enable real-time intelligence. The flagship product, the PI System, enables your organization to capture and leverage sensor-based data across the enterprise to improve efficiency, sustainability, quality and safety.

The PI System empowers organizations across a range of industries in activities such as exploration, extraction, production, generation, process and discrete manufacturing, distribution and services to leverage streaming data to optimize and enrich their businesses. For over thirty years, OSIsoft customers have embraced the PI System to deliver process, quality, energy, regulatory compliance, safety, security and asset health improvements across their operations. Founded in 1980, OSIsoft is a privately held company, headquartered in San Leandro, California, U.S.A, with offices around the world.

> *"Sensor-based data is different and requires different approaches to manage and process before it can be used reliably, efficiently and continuously within big data analysis. Sensors can deliver continuous or fragmented time series data streams in immense volumes and high frequency. Whether batch processing or streaming sensor data for big data analytics sensor data needs manipulation, indexing, aggregation, contextualization and governance before delivering to big data analytics engines. It's essential to get this right otherwise the value of the data will be lost."*
>
> ***Richard Beeson***
> Chief Software Architect and CTO
> OSIsoft

Read the Gartner/OSIsoft white paper:
Architecting an Industrial Sensor Data Platform for Big Data Analytics: Continued

Additional resources:

- City of Calgary: Using Data to Predict and Mitigate Floods
- JuiceBox Charging Solution Leverages Data from Connected EV Network for Smart Charging and Grid Optimization
- Itochu's Innovative Cloud-Based Services Connect Japan's New Energy Ecosystem

OSIsoft website >

Saudi Telecom Company (STC) is the largest telecommunication services provider in the Middle East and North Africa. It is the leading operator within the Kingdom of Saudi Arabia, and its international presence extends to nine countries.

The company is working continuously to fulfill and satisfy the market requirements, keeping pace with the emerging technologies in the telecommunications sector and satisfying its customer's needs. STC has put in its consideration that this is the way to reinforce its position and identity in view of a changing world where the role and usage of telecommunications became more significant.

STC offers mobile, landline, television and Internet services. Its goals include becoming the next-generation leader in broadband.

Saudi Telecom Company is a member of the Telecom Council of Silicon Valley. The Council connects companies and individuals involved in the communications technology industry with one another for business development, collaboration and education. STC is the first telecom company in the Middle East to join the Council, which has over 100 member companies

Saudi Telecom website >

Black & Veatch is an employee-owned, global leader in building critical human infrastructure in the Energy, Water, Telecommunications and Government Services sectors. Since 1915, we have helped our clients improve the lives of people in more than 100 countries through consulting, engineering, construction, operations and program management.

In keeping with our Building a world of difference® mission, Black & Veatch is committed to the innovation and adoption of advanced technology solutions to build more sustainable cities and communities. Black & Veatch is at the forefront of the movement toward smarter, more integrated infrastructure systems that extend beyond company and industry boundaries. We deliver new sources of value through the integration of distributed infrastructure, smart sensors, communications networks, automation systems, and big data and analytics. These Smart Integrated Infrastructure (SII) solutions increase system-wide intelligence to improve the efficiency, reliability and resiliency of the fundamental services we rely on every day.

Black & Veatch SII solutions for Smart Cities include:

- **Design & Construction:** In addition to engineering, procurement and construction (EPC) services for core Energy, Water and Telecom infrastructure, we provide EPC services for distributed infrastructure systems including stationary storage, Electric Vehicle (EV) charging stations, microgrids and distributed generation systems.
- **System Integration:** As consultant, program manager and integrator, we combine our own expertise with our world- class partner network to plan and implement turnkey smart city solutions.
- **Smart Analytics:** Leveraging our ASSET360™ analytics platform and third-party technologies, we provide community-scale data management and analytics solutions that enable integrated management of resources such as energy, water and gas.
- **Operations Support:** We help clients with the ongoing lifecycle management of their smart systems – maintaining overall performance and supporting individual community participant needs.

Learn more: Smart Integrated Infrastructure

Related links:
Peoria, Arizona - Butler Water Reclamation Facility
Los Angeles: Echo Park Lake Rehabilitation
SDG&E Sunrise PowerLink project
Video: Powering the Charge for Electric Cars

Organic Energy Corporation is an advanced municipal solid waste (MSW) separation and re-purposing company. OEC specializes in maximizing the recovery and diversion of recyclables and resource feedstock from landfill bound MSW.

OEC currently holds five patents on the MaxDiverter™ sorting process and has numerous additional patents pending.

OEC is also the driving force and lead partner for EcoHub, an innovative collaboration of premier organizations working together to reclaim discarded resources to achieve a waste free society.

Using proven technology that has been organized and utilized in innovative ways, EcoHub allows for every piece of the waste stream to be collected using "one bin" and accurately sorted into separate resource categories. EcoHub's manufacturing partners then re-purpose these resources into new, viable products (e.g., paper products, building products, natural gas, etc) that can be distributed to the local community – a true closed-loop solution for the world's growing waste disposal problem.

With long-term access to the waste stream, OEC/EcoHub can help partner cities reduce costs, catalyze economic development and generate improved environmental outcomes.

Learn more about Organic Energy Corporation >

Learn more about EcoHub >

Urban Integrated Inc., part of The Urban Institute® group, is a leading software and consulting company for Smart City Solutions. In particular, [ui!] offers integrated cloud based services that bring together the various data sources across the city into one platform.

UrbanPulse consolidates and readies data from the various sources across the city into actionable intelligence, using big data analytics and algorithms for decision-making and automation. Users are the city government, businesses, utility providers and citizens. The solution is presented as an open cloud based platform and is available for others to build on top.

The Urban Institute was established in Germany to help cities define and realize their smart city strategies in line with the European Union directive Euro 2020., that foresees a 20% reduction in energy usage, 20% reduction in emissions, and a 20% increase in the use of renewables by 2020.

Making cities even smarter :

- Urban Integrated website
- The Urban Institute website
- Case Study City of Darmstadt, published by Microsoft

Space-Time Insight helps asset-intensive organizations make faster, more-informed decisions. Our real-time visual analytics applications correlate, analyze, and visualize large volumes of business, operational and external data, spatially, over time and across network nodes. Our award-winning software powers mission-critical systems for some of the largest organizations around the world, helping them reliably, efficiently and economically deliver services and rapidly plan for and respond to a full range of operating events.

Space-Time Insight provides solutions for utilities and government, among others.

Utilities: Space-Time Insight's breakthrough situational intelligence applications for utilities provide unprecedented 360-degree operational and planning insight by correlating, analyzing and visualizing IT, OT and external (XT) data sources spatially, over time and across network nodes. Our applications deliver greater capital and operational efficiency, safety, and reliability in a matter of months. Space-Time Insight's software helps some of the largest utilities around the world reduce costs, uncover revenue opportunities and deliver more reliable services to their customers. Learn more >

Government: Cities need a smarter way to work together across functional and organization divides to plan, justify, and allocate capital efficiently in support of building, operating, and maintaining the digital infrastructure of the Smart City. To deal with major events, either planned or unplanned, cities require a single, shared view of the situation they face. Space-Time Insight helps break down governmental organization and data silos by ingesting disparate data sources into its patented in-memory system, correlating the data across space, time, and node, and extracting the key information or events that become the basis for better, more informed decision making. Learn more >

View video about Space-Time Insight at Sacramento Municipal Utility District

Visit spacetimeinsight.com

As the new hallmark for a more sustainable future, smart communities start with a smart grid. They are the heartbeat that powers the community's critical infrastructure and the foundation for enabling power, water, transportation, public safety and other services to function in harmonious, mutually supportive concert. And when it comes to smart grid, Elster provides the solutions needed to vitalize our communities by bringing smart meter data to the people and processes that depend on it.

With smart grid and AMI solutions, plus street and area lighting, Elster is a one-stop shop for smart community solutions and is helping public power utilities everywhere unlock the value of their meter data.

In an Elster-enabled smart community, power demand and consumption are automatically controlled to reduce peak demand. Smart sensors monitor and control streetlights based on brightness and time. Municipal broadband communications platforms underpin smart grid operations – and also provide the community with free Wi-Fi. Utilities proactively notify customers about leaks before they become a problem.

When communities are smart, energy intersects with traffic control, electric vehicles, solar power, security systems – the list has no limits. The result? Happier customers, improved system reliability, enhanced operational efficiency and better environmental sustainability.

This is the smart community future. And it's enabled by Elster – today.

Learn more about Elster:
Elster Solutions website
Connexo: Simplifying the utility journey
Advanced Meter Fort Collins

Videos:
Transformer Optimization
Leak Detection
Nontechnical Loss
Outage Management
Smart Communities

Bit Stew Systems is the creator of the market leading platform for Software Defined Operations for the Industrial Internet.

Bit Stew's revolutionary information processing engine, MIx Core™ enables complex event processing, advanced analytics and sophisticated machine-intelligence. The MIx Core technology has proven scalability to provide end-to-end operational visibility for billions of connected devices and trillions of data points—making it the ideal platform for the Industrial Internet. This same MIx Core technology can also be embedded in devices, gateways and routers for intelligence and automation directly at the edge of the network.

Bit Stew's flagship product solution, Grid Director™ is built on MIx Core and designed specifically to meet the exacting demands of the utility industry. Grid Director offers customers complete visibility and control of their networks enabling more agile and informed decision-making that improves reliability, efficiency and performance. Grid Director provides real-time analytics, pattern recognition, dynamic event management, and rapid integration across enterprise systems and applications.

Incorporated in 2009, Bit Stew Systems is a venture-backed private company that is headquartered in Canada with offices in the USA, Australia and Europe. Bit Stew was named on the Gartner Cool Vendors in Energy & Utilities list for 2014 and the Frost & Sullivan Entrepreneurial Company of the Year – North American Service Solutions for Utilities.

Visit the Bit Stew Systems website >

Silver Spring Networks is a leading networking platform and solutions provider for smart energy and smart city networks. Silver Spring's pioneering IPv6 networking platform, with more than 20 million Silver Spring enabled devices worldwide, is connecting critical infrastructure around the globe to help improve energy reliability, enable cities to provide better services to citizens, and unlock the next generation of applications for the Internet of Things.

Silver Spring's innovative solutions enable utilities and cities to gain operational efficiencies, improve grid reliability, and empower consumers and citizens. Silver Spring's major utility customers include Baltimore Gas & Electric, CitiPower & Powercor, Commonwealth Edison, CPS Energy, Florida Power & Light, Jemena Electricity Networks Limited, Pacific Gas & Electric, Pepco Holdings, Progress Energy and Singapore Power, among others.

Silver Spring connects smart city infrastructure in cities on 5 continents including Bristol, Chicago, Copenhagen, Glasgow, Melbourne, Miami, Paris, Sao Paulo, San Francisco, Singapore and Washington, D.C. Silver Spring is partnering with Florida Power & Light for the world's largest connected lighting project, nearly 500,000 networked street lights across South Florida.

Silver Spring's smart city platform helps municipalities deploy canopy networks connecting critical infrastructure assets such as public lighting and others. These intelligent lighting systems dramatically improve system reliability, increase energy efficiency, lower operational costs, and enhance citizen safety and quality of life. Silver Spring's open, standards-based network also enables cities to establish a platform for future smart city applications and services such as traffic management, environmental sensors, smart parking, electric vehicle charging, electricity metering, water conservation, and many others.

Learn more at our website >

Civic Resource Group International's **mission – *Fulfilling the Promise of Technology* – is perfectly aligned with the Smart Cities Council's vision of "a world where digital technology and intelligent design have been harnessed to create smart, sustainable cities with high-quality living and high-quality jobs."**

CRG International is one of the world's leading providers of digital government solutions. The company develops innovative, highly secure digital solutions built on CRG's flagship product CivicConnect™, a first-of-a-kind fully integrated Mobile/Cloud/Data Platform delivered in a SaaS model (Software as a Service) for the broad public sector. With its major focus on the key "smart" sectors, such as public transportation, environmental/utilities, tourism/economic development, regional planning/MPOs and health care, CRG's work touches every facet of citizens' lives. The company's "Smart" Offering – CivicConnect combined with CRG's CivicConnect business-specific line of products such as "Smart City," "Water," "Traveler Relationship Management (TRM)" "Parking,' "Geo-Social Mapping," CivicAR™ (Augmented Reality for Public Sector) and "Community," among others, have been developed to address fast-changing public sector needs resulting from the massive move to the emergence of the Internet of Things.

Since 2000, CRG has been "fulfilling the promise of technology" for clients in the broad public sector by leveraging the award-winning CivicConnect™ Platform and deep domain expertise. CRG's impactful, engaging and cutting-edge products have a proven record of facilitating openness, transparency, safety and efficient service delivery for communities and their constituents. CRG is a new breed of company with a new approach, blending the best of technology, design and communications in the digital age to support Sustainable Communities, Efficient Public Services, Engaged Citizens and Overall Better Quality of Life.

In early 2015, CRG was named to CIOReview's Top 20 Most Promising Government Technology Providers list, recognizing CRG's role in leading the digital transformation of the broad public sector in both the U.S. and international markets.

Throughout the world, city leaders recognize LED lighting as the most efficient entry point on their journey to becoming a smarter city. Not only do LED lights deliver more than 50% in energy and operational savings, but this infrastructure upgrade can also provide a new network to support a wide range of smart city and smart grid applications, like enhanced public safety, air quality and traffic monitoring.

ProFieldLight, our award-winning mobile workforce management technology, helps ease the road to smart city implementation by effectively managing a variety of LED lighting initiatives. ProFieldLight ensures safety, reliability and on-time project completion so our customers reap the benefits of energy efficiency while protecting their bottom line.

No matter where you are on the road to Smart Cities, ProField® can light the way.

Visit: **Apex LED lighting solutions**

Around the globe, Veolia helps cities and industries to manage, optimize and make the most of their resources. The company provides an array of solutions related to water, energy and materials – with a focus on waste recovery – to promote the transition toward a circular economy.

Veolia's 187,000 employees are tasked with contributing directly to the sustainability performance of customers in the public and private sectors, allowing them to pursue development while protecting the environment.

To this end, the company designs and deploys specialist solutions to provide, protect and replenish resources while increasing their efficiency from an environmental, economic and social standpoint. Such initiatives are all part of Veolia's ongoing campaign to resource the world.

- We turn waste into materials
- We work to save water and energy
- We work with municipalites around the world

Learn more at our website >

Today the Internet of Things (IoT) has enormous potential to drive economic value and social change. But with 85% of things still unconnected and security threats pervasive, the industry has yet to tap IoT's enormous potential.

The Intel® IoT Platform breaks down these obstacles. It provides an end-to-end platform for connecting the unconnected – allowing data from billions of devices, sensors, and databases to be securely gathered, exchanged, stored, and analyzed across multiple industries.

Once largely a PC-oriented company, Intel® increasingly provides the vital intelligence inside a wide range of devices, from the lowest-power mobile devices to the most powerful supercomputers in the world.

Since introducing the industry's first commercially available memory chips in 1969 and the first microprocessor in 1971, Intel makes hardware and software products that power the majority of the world's data centers, connect hundreds of millions of cellular handsets and help secure and protect computers, mobile devices and corporate and government IT systems. Intel technologies are also embedded in intelligent systems including for automobiles, digital signage, automated factories and medical devices.

Related resources:
San Jose and Intel leverage IoT innovations
Smart Cities UK: Imperial College and Intel IoT Project
Urban Growth and Sustainability: Building Smart Cities with the Internet of Things
Pecan Street Project: Smart Grid and Internet of Things

West Monroe Partners is an international, full-service business and technology consultancy focused on guiding organizations through projects that fundamentally transform their business.

With the experience to create the most ambitious visions as well as the skills to implement the smallest details of our clients' most critical projects, West Monroe Partners is a proven provider of growth and efficiency to large enterprises, as well as more nimble middle-market organizations.

Our consulting professionals – more than 550 and growing – drive better business results by harnessing our collective experience across a range of industries.

West Monroe Partners is dedicated to helping cities leverage technology and update their processes to transform how they serve their citizens, optimize their physical assets, and how they partner with their employees.

- Learn about our work in Energy & Utilities
- Learn about our work in Healthcare
- Learn about our Advanced Analytics

Visit the West Monroe Partners website >

Spire Metering Technology is a leading manufacturer and global provider of flow- and energy-management solutions. Through continuous innovation, we transform cutting-edge technologies into affordable, reliable and simple-to-use tools for accurate utility measurement. SpireMT's technological innovations help cities, governments and industry leaders preserve our precious natural resources.

Water and energy usage have a significant impact on communities around the world. SpireMT's meters and metering systems help regulate water and energy consumption in commercial and residential buildings, along with municipal and government facilities.

Thanks to SpireMT's diverse product line, our partners can rely on our technology to overcome the challenges of measuring a variety of fluid types, including water, oil, electricity and chemicals. Our products satisfy all their project needs, from flow measurement to energy measurement to wireless telemetry systems, AMR/AMI systems and billing software for instantaneous results. By utilizing SpireMT's solutions, our partners are empowered to responsibly manage their resources. SpireMT's comprehensive utility metering systems help to ensure tomorrow by measuring today.

Spire Metering Technology provides a wide variety of flowmeter products to meet the demanding requirements of several applications, including:

- Water and wastewater
- Utility management
- Building automation

Learn more at our website >

For organizations striving to leverage big data to their competitive advantage, data science is the essential, but often unrecognized, ingredient. TROVE is a leader in this nascent and rapidly expanding field, going far beyond traditional analytics approaches to solve some of today's most complex data management problems.

The heightened levels of insight and knowledge enabled by this technology have never been more important to the world's cities as they are today. Becoming a smarter city and making informed decisions about growth, infrastructure and citizen services requires the ability to process vast – and ever-increasing – volumes of data -- and to understand data relationships that are not intuitively obvious. That's where TROVE can help – by taking the guesswork out of important business decisions.

TROVE delivers one-of-a-kind, data-powered predictive science that delivers previously undiscovered insights and value by combining an organization's own data with TROVE's 2,000+ attributes of external third-party data and its patented data fusion algorithms. These are algorithms that have been used by the Department of Defense and other intelligence agencies to dramatically improve the accuracy and effectiveness of critical strategic and tactical decisions. The technology has been field-proven by the most accuracy-sensitive organizations in existence and is now available for the rest of the world to leverage.

The result? Startling predictive insights and new ROI value in unexpected places. Smart cities don't guess. They predict problems before they occur. They proactively address growth challenges and anticipate citizen demands. They look forward, not backward and make smarter decisions based on facts.

TROVE can show you how. Find out how TROVE and its data science as a service (DSaaS) model brings advanced technology previously available to only the largest corporations to any city seeking new levels of insight to fuel the next era of business productivity.

To learn more about TROVE, please visit our website at TroveData.com.

Since 1995, K2 Geospatial has been committed to bringing spatial information and analysis tools within everyone's reach by developing software solutions that provide effective visual aids to decision-makers. K2's Map-Based Solutions connect, consolidate and publish data which are managed and stored in silos in different systems. Employees and citizens can then easily access the information, analyze it and have a real-time ability to decide.

These solutions are designed for land, infrastructures, buildings management as well as for environmental and public safety purposes. They are used by cities, regional governments, ports, airports, road authorities, railways, public utilities and natural resources companies.

K2's solutions are powered by JMap, a map-oriented integration platform designed to connect silos and offer easy-to-use interfaces dedicated to non-technical users. Furthermore, for software developers, JMap can be easily embedded in their existing solutions.

JMap is deployed and used by hundreds of organizations in North and South America as well as in Europe. Each day, thousands of employees and citizens from different organizations, in different contexts and with different requirements, use JMap to access their spatial and non-spatial data (from GIS, databases, sensors, GPS, RFid, Web Services, videos, etc.) in order to get a global and a real-time overview of their operations.

With JMap, cities easily implement Spatially Smart Solutions which improves their operational and strategic decisions.

Learn more about JMap >

Visit the K2 Geospatial website >

At Clevest, we share the Smart City Council's vision of cities that are livable, workable and sustainable. As a leading provider of mobile workforce automation solutions for smart grid and smart city field operations, Clevest is proud to support and educate city leaders, planners and citizens in building sustainable cities.

Clevest provides the only complete solution for mobile workforce automation, smart grid and smart city operations exclusively for utilities and city operational departments. Over 150 customers worldwide have chosen Clevest to transform their field operations by harnessing the power of our software and deep domain knowledge of mobile computing and field operations.

We are specialists at enabling cities to transform their field operations by rapidly automating and optimizing field installation, operations and maintenance of new smart technologies. Our solutions improve worker and citizen safety, reduce the environmental impact of field work and increase operational efficiency to drive down the cost to serve citizens.

Clevest Smart City solutions are purpose-built for city operations departments to effectively deploy, operate and maintain new metering, monitoring and control, and network communications technologies within their smart city infrastructure. In the control room, our solution enables real-time insight to the location and status of field workers, trouble events and field work locations in the visual context of city infrastructure. This allows the quick identification of work to be completed, seamless appointment bookings, and the automatic scheduling and assignment of work. In the field, our streamlined workflows help field workers quickly complete work on a mobile device, view contextual data on maps and stay safe with support from nearby workers and alerts to the control room.

Clevest offers the complete solution for the smart city mobile workforce to help deploy, operate and maintain your smart city infrastructure.

Learn more about Clevest

Learn more about our solutions

Badger Meter's commitment to helping municipalities improve operational efficiency and conserve their precious resources, makes supporting the Smart Cities Council a natural fit.

Badger Meter offers end-to-end solutions that help water utilities generate needed revenue, monitor and conserve their resources and help them better serve their valued end water customers. Industry-leading smart water solutions include a comprehensive mechanical and electronic metering line, proven AMR/AMI technology and the powerful analytics tools that truly help in Making Water Visible® for thousands of cities.

Badger Meter smart water solutions:

- Increase visibility of water consumption through tools like BEACON® Advanced Metering Analytics, providing faster leak detection, revenue management, water conservation clarity, and easier data collection for compliance reporting.
- Enhance customer service for citizens through powerful apps that provide greater water usage visibility directly to their PCs, tablets and smartphones.
- Minimize deployment and system maintenance though a managed solutions approach that reduces required operational management of AMI and analytics, allowing water departments to do what they do best—delivering high quality water to customers.
- Future-proof technology by working with cities to ensure their water system design keeps pace with technology advancements for the long term.

Founded in Milwaukee, Wisconsin in 1905, Badger Meter has earned an international reputation as an innovator in flow measurement and control products, serving water utilities, municipalities, and commercial and industrial customers worldwide.

Learn more about Badger Meter Water Utility Solutions

Entrigna's software enables cities to radically change the way they make real-time decisions. Entrigna is excited to support the Smart Cities Council and help contribute to building tomorrow's cities today. Our software sits squarely in the "crunch" function of a smart city.

With the infrastructure to collect and communicate data, tremendous opportunity exists to derive value from the data by making real-time decisions and taking immediate action without human intervention. Entrigna's software provides the smart city a central "brain" to enable this capability, which goes far beyond reports and dashboards.

The human brain processes data in real time from senses and memory and applies several techniques seamlessly in parallel and in series to make decisions and take an action – e.g., if it's Monday, then I will do xyz; if I have 10 items on my To-Do list, I will prioritize them in this order; based on similar prior experiences, I think xzy is the best decision. It's a complex and amazing process.

Just like a human brain, Entrigna's software can ingest data from a variety of sources streaming in real time. The data can be anything that is collected and communicated through the smart city infrastructure such as water meter reading, traffic conditions, geo location of an individual, data from wearable devices.

With maximum flexibility to combine in parallel and in series, decision frameworks are configured to make "brain-like" decisions. These frameworks automatically run in real time (milliseconds) and do not require manual intervention by a person.

Mathematical and algorithmic techniques are leveraged to mimic a brain, such as a rules engine, complex event processing, optimization, regression, clustering/classification, natural language processing, machine learning and artificial intelligence.

Because of Entrigna software's unique design and architecture, implementation delivers a full set of functionality but at less than 50% of traditional timeliness and less than 50% traditional costs.

To learn more, please visit our website: www.entrigna.com.

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Environmental Defense Fund
International Water Association
Natural Resources Defense Council
Water Alliance
Smart Water Networks Forum (SWAN)
The Climate Group
The Nature Conservancy
Teru Talk

Governmental Agencies

Dubai Real Estate Institute
New York City Transit Authority
Portland Development Commission
San Francisco Municipal Transportation Agency
Sustainable Streets

National Laboratories

National Renewable Energy Laboratory
Pacific Northwest National Laboratory

Public Sector Associations and Advocates

100 Resilient Cities
Center for Public Policy Innovation
City Protocol Task Force
CompTIA
EcoDistricts
Institute for Sustainable Communities
National Governors Association
Pew Charitable Trusts, American Cities Project
Pedro Ortiz, Senior Urban Consultant, World Bank
Public Financial Management – PFM Group
Research Triangle Cleantech Cluster
Rockefeller Institute for Government
Sault Ste. Marie Innovation Center
TM Forum

Standards Bodies

American National Standards Institute
Institute of Electrical and Electronics Engineers (IEEE)
International Electrotechnical Commission (IEC)
International Organization for Standardization (ISO)
International Telecommunication Union (ITU)
Open Geospatial Consortium

Trade Associations

Information Technology Industry Council (ITI)
Fibre to the Home Council - MENA
National Electrical Manufacturers Association (NEMA)
Research Triangle Cleantech Cluster

Universities

Arizona State University School of Public Affairs
Boyd Cohen, Universidad del Desarrollo
Carnegie Mellon Intelligent Coordination & Logistics Lab
Center for Technology in Government
ESADE Institute of Public Governance and Management
Illinois Institute of Technology
Institute of Transportation Studies, UC Davis
Plug-in Hybrid & Electric Vehicle Research Ctr UC Davis
Research Institute for Water Security, Wuhan University
Transportation & Sustainability Research Center, UC Berkeley
Universitat Autònoma de Barcelona
University of Ontario Institute of Technology
Waterloo Institute for Sustainable Energy, Univ. of Waterloo